

*The*

FEBRUARY 1942

# TOOL ENGINEER

MACHINERY

• PRODUCTION

• TOOLS

## AIR HARD

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Official Publication of the American Society of Tool Engineers



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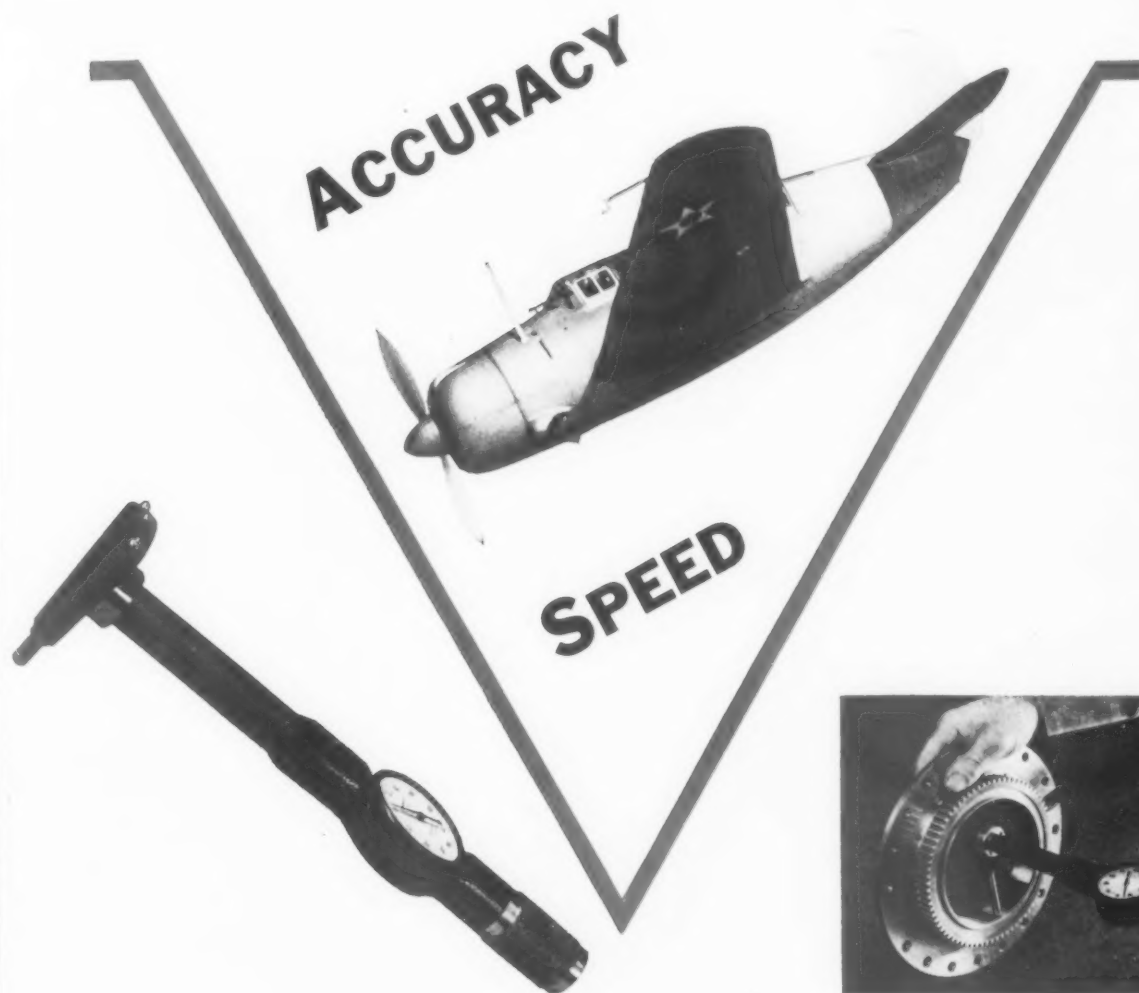
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# THE TOOL ENGINEER

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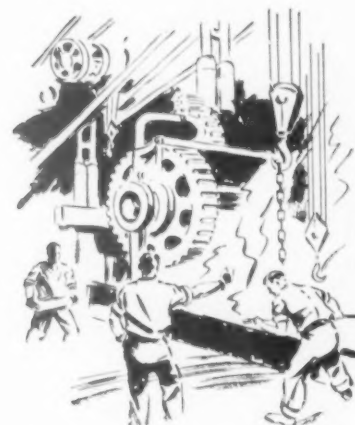
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### IT'S UP TO TOOL ENGINEERS, NOW

Seven days a week are hardly enough to get war production started. To supply each trigger man today, 18 non-combatants, compared with 5 in the last war, are required. Faster machining and time saving are vital. Every Tool Engineer needs to know, instantly, about the latest machines and tools. That is the purpose of next month's Special Issue of TOOL ENGINEER. It will be a regular Machine and Tool Show on paper, featuring the latest in Machines and Tools.

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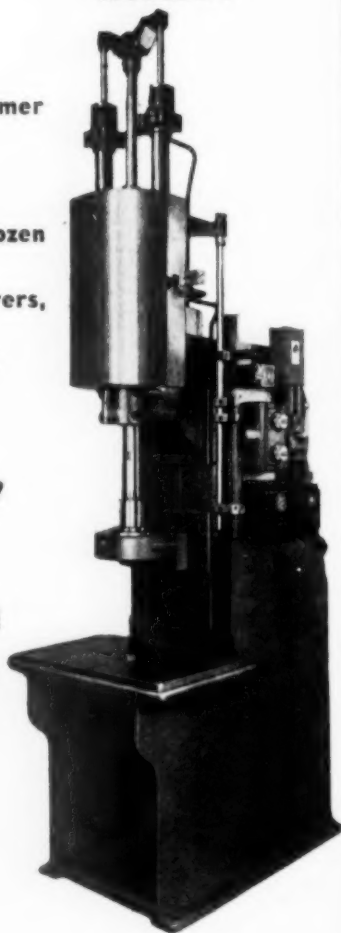
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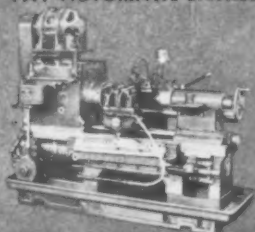


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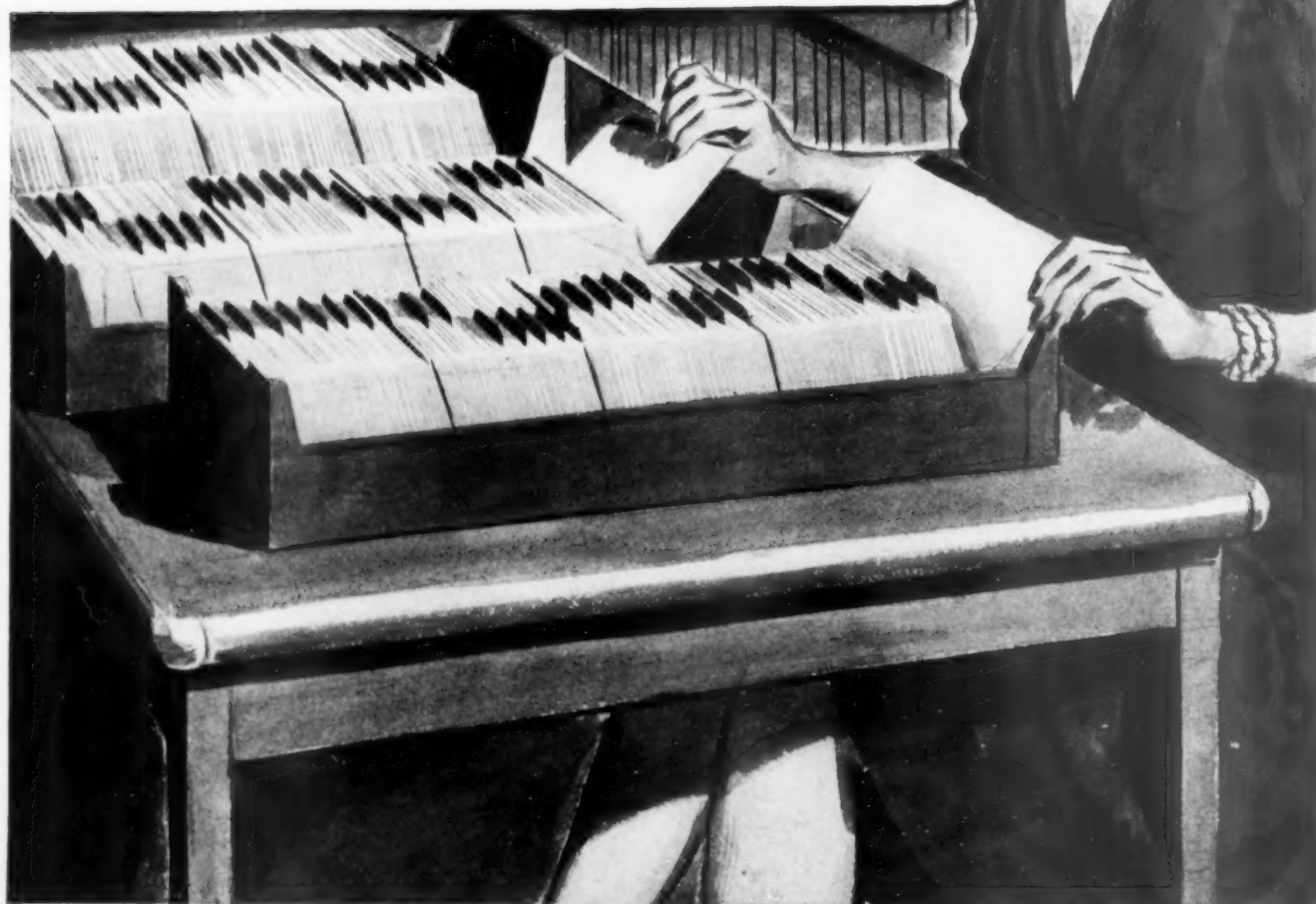
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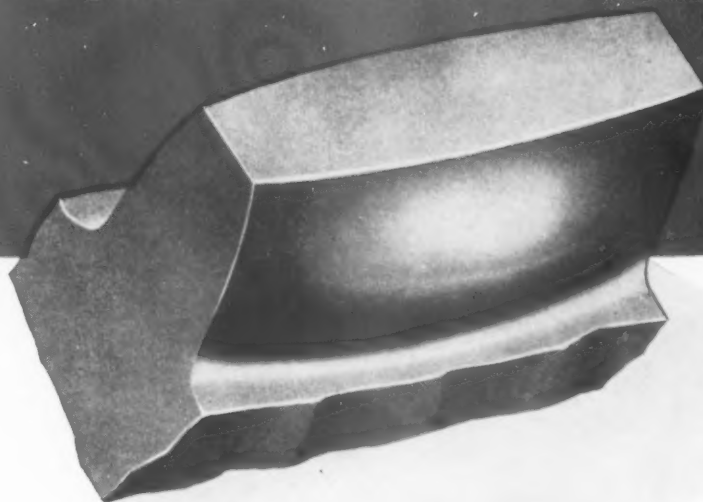


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THE TOOL ENGINEER

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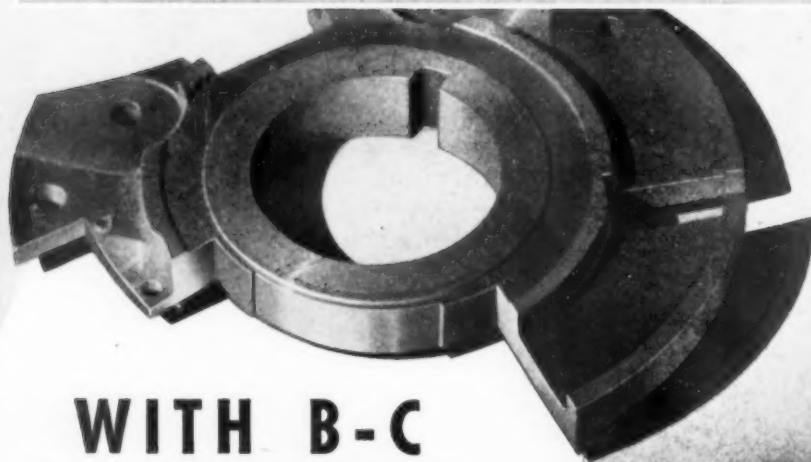
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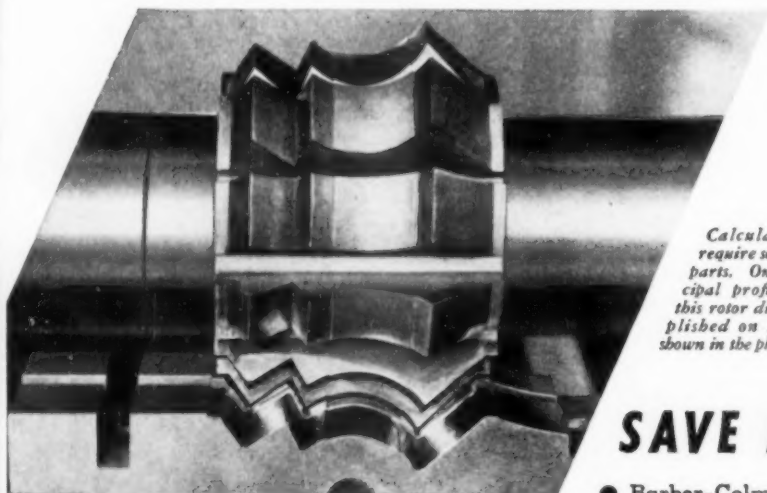
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# ONE PIECE Every 90 Seconds



## WITH B-C UNGROUND FORMED CUTTER



*Calculating machines require some odd-shaped parts. One of the principal profiling cuts on this rotor disc is accomplished on the set-up shown in the photographs.*



## SAVE MONEY!

### PRODUCTION DATA

Name of Part — Rotor Disc  
Material — Soft Brass  
Thickness of Piece — .2362"  
Feed — 5" per minute  
Cutter Speed — 400 r.p.m.  
Machine — Brown & Sharpe No. 0  
Holding Means — Clamped in Special Fixture in Screw Vise; Piece located by Center Keyed Hole.  
Production — 40 pieces per hour.  
Pieces per Cutter Grind — 1200.

● Barber-Colman UNGROUND Formed Relieved Milling Cutters are, naturally, lower in cost than the ground type, yet they have an inherent accuracy which is adequate for a great many profiling and form-cutting operations. For instance, on the example shown, the form is held to an accuracy of less than .001". For freer and faster cutting, we recommend these cutters with *spiral* gashes, and we can provide cutters of this type with accuracy comparable to those with straight gashes. (The cutter shown here has straight gashes.) Barber-Colman Formed Cutters made a name for themselves in World War I on small arms production and the added experience gained on thousands of jobs in the intervening quarter-century is your guarantee of satisfaction.

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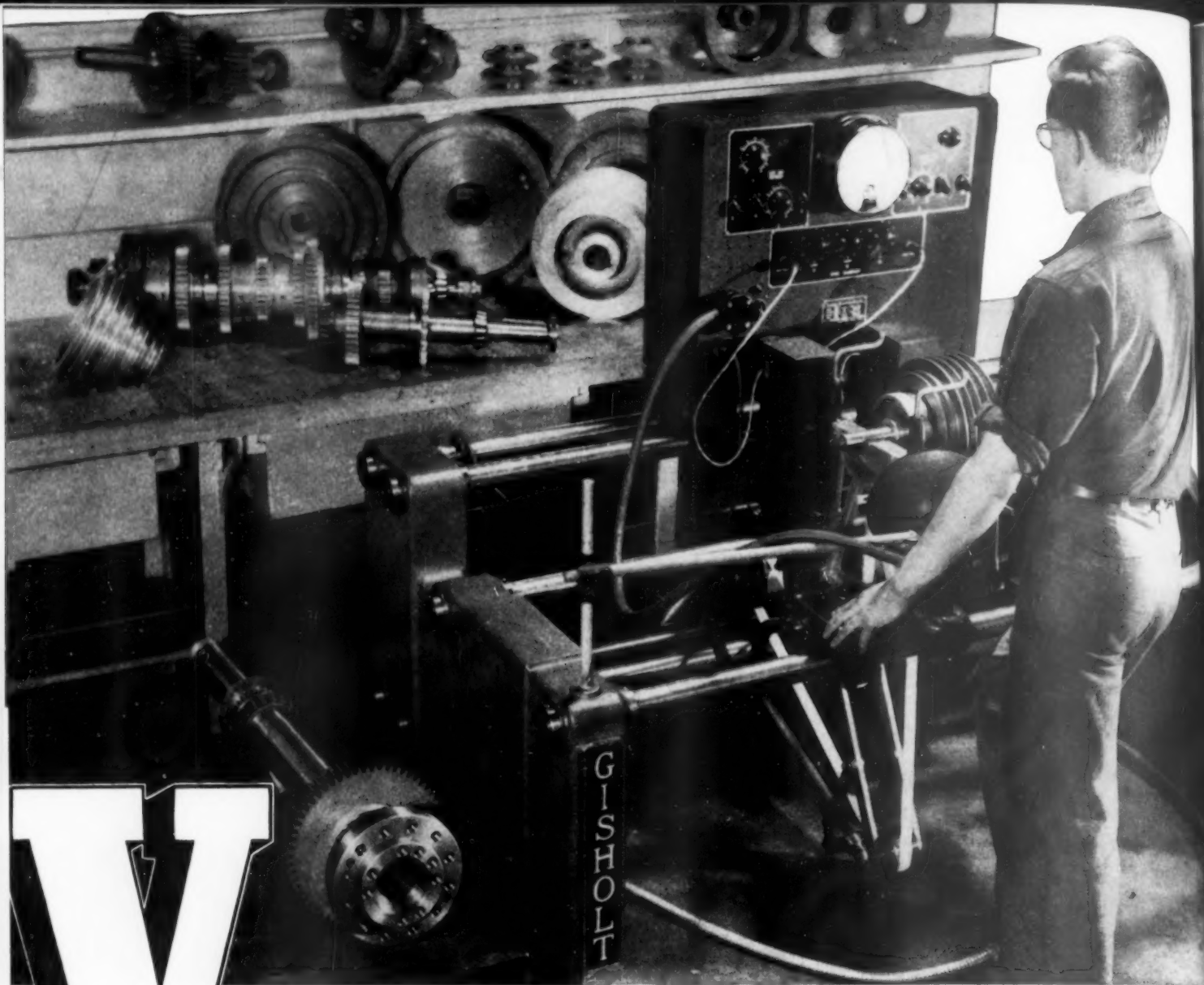
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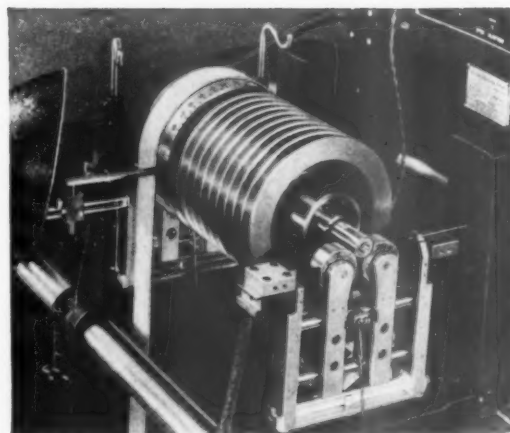
This development enables you to make important product improvements—to eliminate noisy and destructive vibration—to assure quieter operation and longer life of rotating parts.

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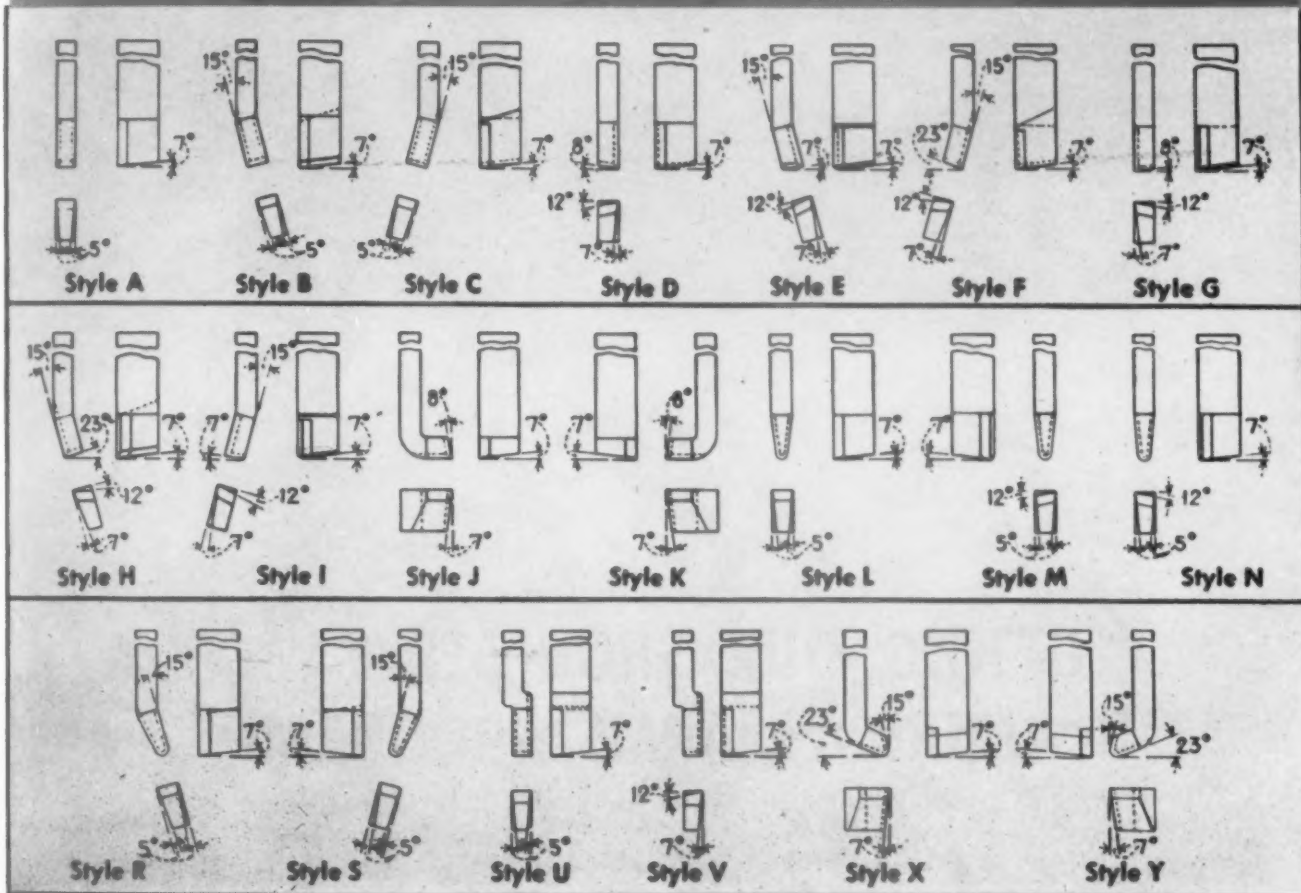
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**Y**OU can take full advantage of the high production properties of Haynes Stellite cutting tools by using the many available styles and sizes of standard welded tip tools. These tools consist of a cutting tip of cast Haynes Stellite alloy welded to a tough steel shank. They can be used where solid bits are impracticable ... and can perform any standard turning, facing or boring operation at low cost per piece machined ... The sizes and styles shown in the table are carried in stock for immediate delivery. Others can be made to order to users' specifications.

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Tool Sizes, inches	Tool Styles
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$\frac{5}{8} \times 1 \times 7$	AD
$\frac{5}{8} \times 1\frac{1}{4} \times 8$	ABCDEFGHIKLMRSUVXY
$\frac{3}{4} \times 1\frac{1}{2} \times 9$	ABCDEFGLMUV
$\frac{7}{8} \times 1\frac{3}{4} \times 9$	A
$1 \times 1 \times 7$	ADGN
$1 \times 1\frac{1}{4} \times 7$	ABDGJKLMNRSXY
$1 \times 1\frac{1}{2} \times 10$	ADUV
$1 \times 2 \times 12$	ADG
$1\frac{1}{4} \times 1\frac{1}{4} \times 7$	ADGJKLMNRSXY

**STYLES OF HAYNES STELLITE STANDARD WELDED TIP TOOLS**



**S**OLID square and flat Haynes Stellite tool bits, and solid milling cutter blades are available for immediate delivery in a wide range of standard sizes. You can also obtain many special tools, such as brazed-in blade milling cutters, spot facers, and core drills; blades for boring and reaming; grooving, cutting-off, and forming tools. Complete information on request.

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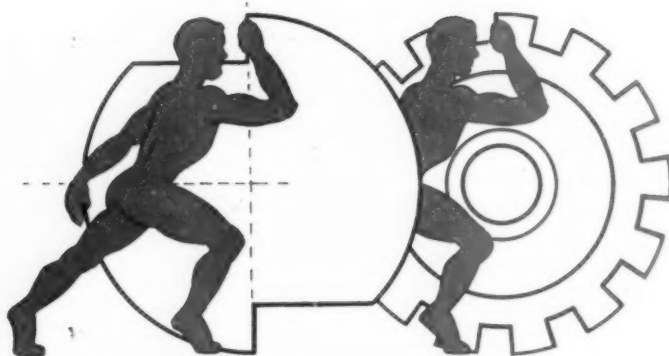
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## **PUTTING OUR SHOULDER TO AMERICA'S ARMS PROGRAM**

EQUAL TO THE OCCASION—Radial (on-center) Drive is producing today for defense of America-at-war true to standards it established in 9 years of strenuous peace-time mass production.

Details on this construction, section 1, our catalog 35.

**ECLIPSE COUNTERBORE COMPANY**  
**DETROIT • MICHIGAN**



FLAME-HARDENED LATHE BEDS . . .

# INSPIRED BY THE *Phantom Gear*

DESIGN ALONE can't account for the success of Monarch's exclusive Flame-Hardened lathe beds—a success proved by the absence of a single instance of failure, wear or scoring in the 5,000 of them built since 1937.

The real power behind this, and the many other Monarch improvements, is what we call "*The Phantom Gear*." This energizing force is made up of open-mindedness, willingness of management and men to work day and night—and the courage to scrap

old ideas and methods that interfere with the building of better lathes.

★ ★ ★

Today, this concentrated effort is turning out a modern Monarch lathe every working hour, day and night, for National Defense. Tomorrow, it will be geared up to produce even better lathes, so that when peacetime industry returns, Monarch will continue to help make more goods for more people at lower cost.

THE MONARCH MACHINE TOOL COMPANY . . . SIDNEY • OHIO

**MONARCH**



**LATHES**

COVER THE TURNING FIELD

## *Monarch's March of Progress*

Many of the outstanding improvements in lathes came from Monarch, such as:

- Flame-Hardened beds*
- Anti-friction bearing mountings for all rotating parts*
- Helical geared headstock*
- Flanged spindle nose*
- Automatic force feed lubrication*
- Anti-friction taper bearing attachment*
- Automatic sizing for all size lathes*

These accomplishments show the urge at Monarch to build better lathes. This same desire will be reflected in every Monarch lathe of the future. It will pay you to keep in touch with Monarch developments.



**"LOGAN"**

**AIR  
EQUIPMENT**

## AS APPLIED TO POTTER AND JOHNSTON LATHE

★ This Potter and Johnston Automatic Turret Lathe is equipped with a "LOGAN" Three Jaw Chuck and a Model "R" Rotating Type "LOGAN" Air Cylinder. The "LOGAN" Chuck combines extra strength and rigidity with extreme compactness and light weight. The double acting "LOGAN" Rotating Air Cylinder is de-

signed to supply power efficiently and economically to all types of chucks required to be mounted on a revolving spindle. This heavy duty "LOGAN" Air Equipment assures positive gripping and rigid support of work. "LOGAN" Representatives and "LOGAN" Engineers will be glad to make recommendations on your chucking problems.



**LOGANSPOUT MACHINE, INCORPORATED**

902 PAYSON ROAD

LOGANSPOUT, INDIANA

Manufacturers of Air and Hydraulic Devices, Chucks, Cylinders, Valves, Presses and Accessories



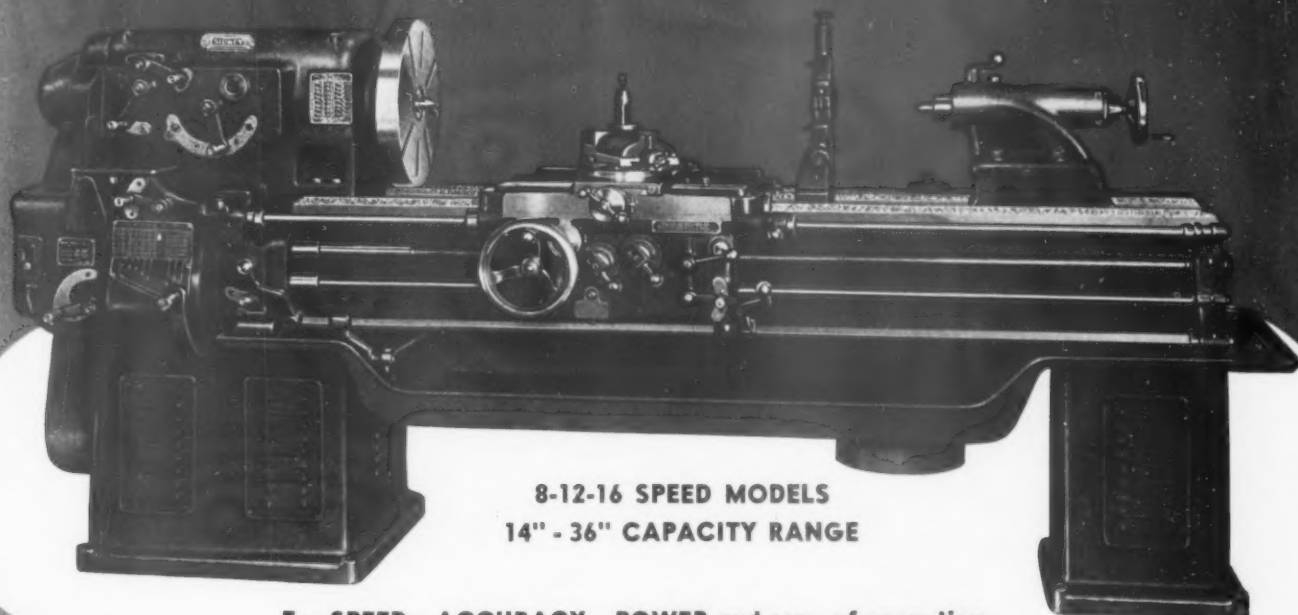




Both have  
**SPEED  
POWER  
ACCURACY**

*for*  
**DEFENSE**

Bulletins available  
for each model lathe



8-12-16 SPEED MODELS  
14" - 36" CAPACITY RANGE

For **SPEED—ACCURACY—POWER** and ease of operation,  
select **SIDNEY LATHES** for your **DEFENSE** work. Particu-  
larly in producing airplane, tank and gun parts are **SIDNEY**  
**LATHES** doing an important **DEFENSE** job.

*The* **SIDNEY MACHINE TOOL Company**  
**SIDNEY** **U.S.A.** **OHIO**



★ WITH POSITIVE LOCKING BLADES

*Free*  
MAIL THE  
COUPON  
TODAY →

# LOVEJOY

## MILLING CUTTERS

• • *for modern metal  
cutting requirements*

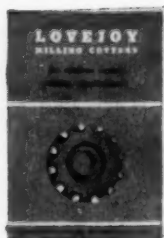
The Lovejoy line of milling cutters is designed to withstand the 24 hour schedule of a wartime production.

Speed, accuracy, and a minimum of sharpening time are absolute requirements — met by Lovejoy Cutters with their husky forged housings, accurately ground bores, and quickly changed positive locking blades.

Lovejoy further assures maximum production because any Lovejoy Cutter of a given type has interchangeable blades over a wide range of cutter diameters. Blades for all standard types are carried in stock for immediate delivery. These blades include High Speed Steel, Cemented-Carbide, Stellite, and Rexalloy.

Lovejoy Milling Cutters and Blades are backed by 24 years of continuous dependable service and satisfied customers.

**LOVEJOY** TOOL CO., INC., SPRINGFIELD, VT.



Please send me my copy of your 24 page catalog No. 26 describing Lovejoy Milling Cutters in complete detail. (No obligation, of course.)

NAME \_\_\_\_\_ TITLE \_\_\_\_\_

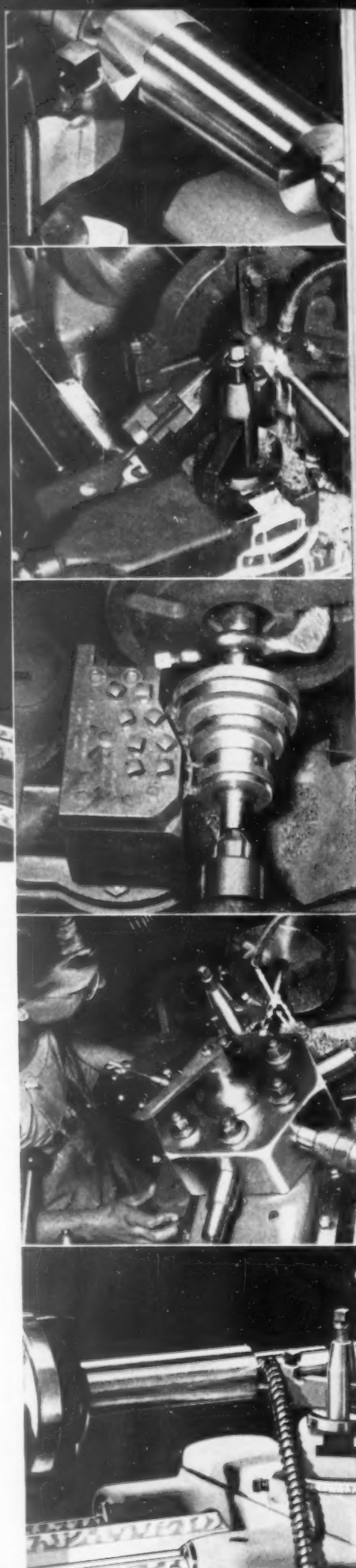
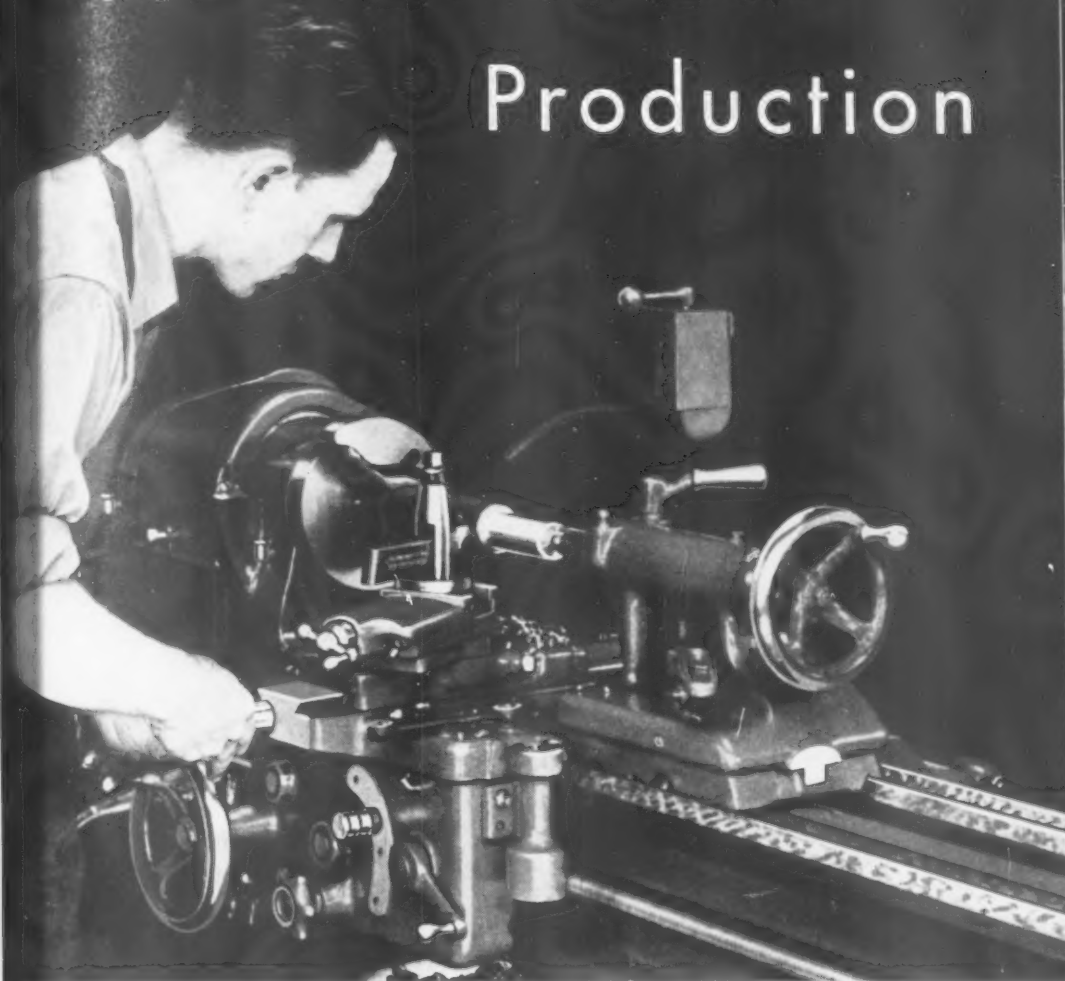
COMPANY \_\_\_\_\_

STREET \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_

M.

# for Efficient Production



## SOUTH BEND LATHES

**E**QUALLY EFFICIENT on precision toolroom work or close tolerance manufacturing operations, South Bend Lathes will help solve your production problems. Hundreds of nationally known manufacturers select them when streamlining their shop equipment to meet present day needs. Substantial savings in capital investment, power consumption, floor space and labor costs have resulted from their installation. They will give you the same efficient, trouble-free service they are giving in the shops of some of the largest defense industries, the Army, and the Navy.

Many features contribute to the efficiency of South Bend Lathes. A wide range of spindle speeds permits machining work with maximum cutting tool efficiency. Their versatility reduces set-up time to a minimum — lowers cost of change-over from one job to another. Smooth, vibration-free operation permits finish turning or boring with such precision that subsequent grinding, honing or lapping operations can often be eliminated. A convenient arrangement of controls makes for an ease of operation which reduces fatigue and lowers the possibility of error.

Maximum production at minimum cost can be attained only when the lathe is matched perfectly with the job. Made in a wide range of sizes and types, there is a South Bend Lathe that will efficiently handle almost any class of lathe work. Write for catalog and name of dealer nearest you.



### SOUTH BEND LATHE WORKS

*Lathe Builders For 35 Years*

477 East Madison Street

South Bend, Indiana, U. S. A.



# Here's Help For You! ON GUN BARREL WORK

## DRILLING, BORING



• Two spindle (No. 420) deep hole drilling and boring machine set up for drilling two 37 mm gun tubes. This machine will handle gun barrels ranging in size from 20 mm up to and including the 75 mm.

### PRODUCTION INCREASED FIVE TIMES ON 37 M.M. GUN TUBE

One manufacturer (name on request) uses three No. 420 machines for drilling and pack-bit boring 37 mm gun tubes. With these machines he has decreased his drilling time from 2½ hours to ½ hour per barrel, floor to floor. Two spindles are fed simultaneously at a feed rate of 1.8 inches per minute.—total penetration rate of 3.6 inches per minute. His boring time has been reduced from 270 minutes to 52.5 minutes per barrel, floor to floor.

### SAVES 50% IN FLOOR SPACE

Floor space required for this machine is no more than that required for a single spindle machine. It is designed for deep hole drilling, pack-bit, and cylinder boring operations only—carries no useless gadgets.

### CONSTANT FEED PER REVOLUTION

The two spindles and hydraulic pumps are driven by the same motor. This feature insures a constant feed per spindle revolution regardless of fluctuation in motor speed due to variance in loads.



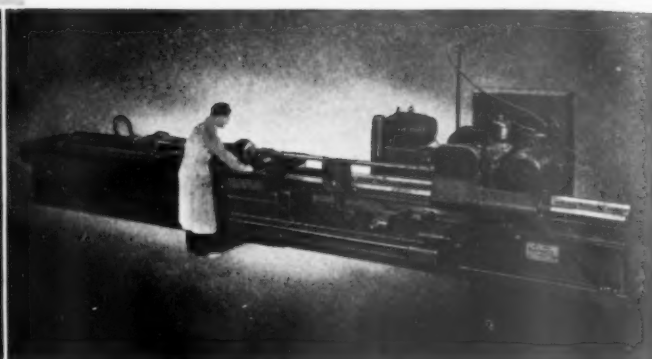
### WRITE FOR FREE BULLETIN

Five deep hole tooling set-ups are illustrated in this bulletin. Drilling, boring, and reaming operations in deep holes are illustrated with line drawings. Coolant arrangements and cutting operations are clearly illustrated. Seven deep hole tools are illustrated and explained.

Packed full of useful up-to-date information, this bulletin will help you simplify a tough job. Write for your copy today. Ask for bulletin TE-2-420.

20

## AND HONING



• The bore-hone, set up for honing 75 mm howitzer gun tubes. The machine is used full time for honing only but can be re-arranged to include boring operations at any future date.

### HOW TO USE THE BORE-HONE FOR FULL TIME HONING OF GUN TUBES

The Bore-hone is capable of performing both boring and honing operations. However, for producing gun tubes on a production basis, we recommend it for honing only, while using the 420 for drilling and boring. The bore-hone is being used for honing the following guns:

### PRODUCTION DATA ON GUN TUBE HONING:

(From actual installations, manufacturers' names on request to bonafide inquiries)

**37 MM ANTI-AIRCRAFT:** This tube is 83¼" long when honed. Both rough and finish honing operations are performed at the rate of 25 barrels in 20 hours. Hydraulically expanded honing tools are used.

**75 MM HOWITZER:** This tube is 48" long when honed. Both rough and finish honing cuts are taken to remove .010" to .015" stock. Production is 45 minutes per barrel, floor to floor. Hydraulically expanded honing tools are used.

**75 MM TANK GUN:** This tube is 84" long when honed. Production is 10 guns per 20 hour day removing .015" to .020" of stock with hydraulically expanded honing tools.

**105 MM HOWITZER:** This tube is 96" long when honed. Production is 1 barrel every 2 hours. Both rough and finish honing is done with the same stone of the hydraulically expanded type.

### SEND FOR COMPLETE DATA

Included in this literature is a complete description of one manufacturer's method of machining landing gear cylinders. The

bore-hone is used for drilling, boring, honing, and tapping. Additional literature covers mechanical features and specifications. Ask for our Bore-Hone data folder T.E. Write today.

THE TOOL ENGINEER



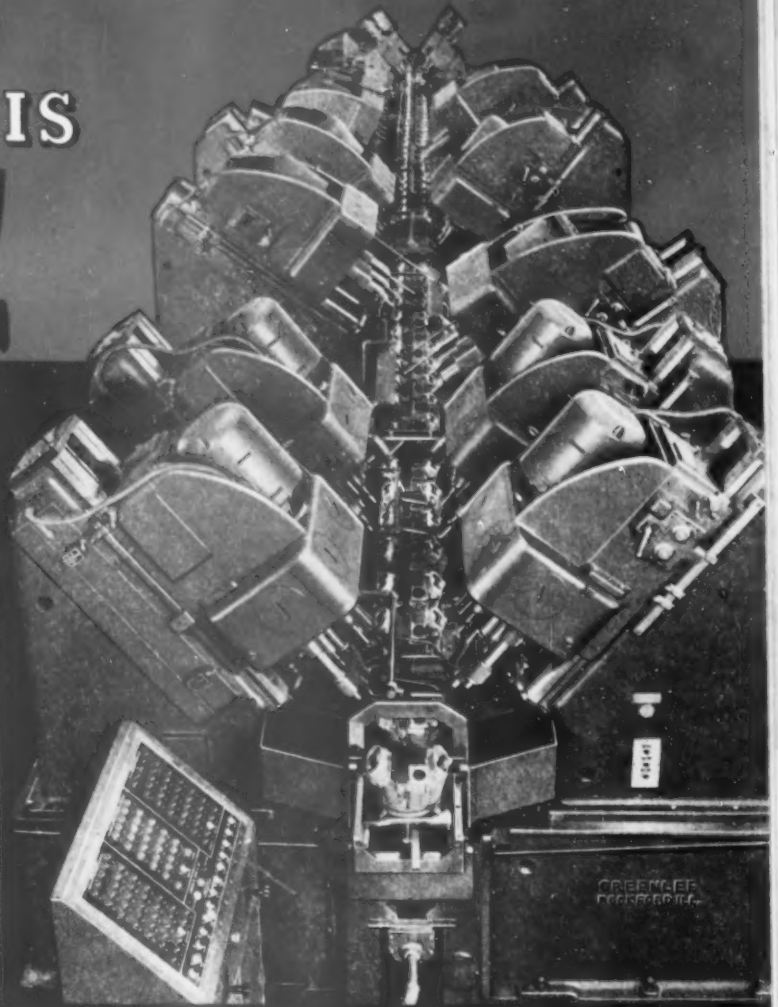


# HERE'S THE KIND OF HELP

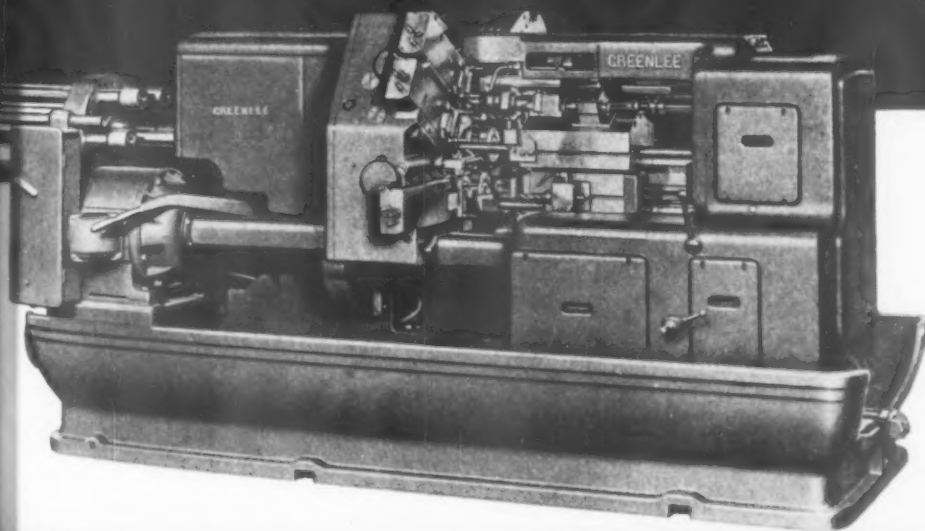
# *Greenlee* IS GIVING IN THIS WAR!

**SPECIAL MACHINES THAT TURN OUT  
ONE AIRPLANE CYLINDER HEAD  
EVERY 45 SECONDS**

Here is one of three Greenlee Multiple-Station, Straight-Line Automatic Transfer Machines installed in the new Wright Aeronautical Corporation plant at Cincinnati for drilling, reaming, counterboring, countersinking, spotfacing, and tapping the aluminum cylinder heads for the Wright 14-Cylinder Cyclone Engine. The machine shown here is 73 feet long, is comprised of 11 way-type machines, and has 56 stations. This group of Greenlee Machines in the Wright Plant, the first to successfully apply mass production methods in aircraft engine production, turns out one completed head every 45 seconds. Years of experience in building special machinery for the automotive industry have gone into these machines and Greenlee Bros. & Co. is proud of the tremendous part that this equipment has in the building of the planes we need so badly today.



**AUTOMATIC SCREW MACHINE  
THAT ARE DAILY SAVING  
VITAL SECONDS**



In the big job facing us today — the task of arming America as fast as possible — Greenlee Automatic Screw Machines are proving invaluable in the production of the shells, aircraft parts, gun parts, munitions, and many other defense products so essential to this nation's safety. The speed of setting up and changing over, and the speed and ease of operation of Greenlee Automatics are daily saving valuable production minutes in hundreds of plants throughout the country.



**MULTIPLE-SPINDLE,  
DRILLING, BORING,  
AND TAPPING  
MACHINES**

**Greenlee**  
**BROS. & CO.**

ROCKFORD ILLINOIS U.S.A.

**AUTOMATIC  
SCREW MACHINE  
SPECIAL  
MACHINERY**



# TURRETS

*that can shape destiny, too!*

● American industry is being fortified for whatever may come with these modern, more efficient turret lathes. The critical need for them in defense production forecasts an equally important need after peace is restored. For then America's place in world trade will depend more than ever on low cost mass production.

Thus, these new tools will also have a direct influence on the destiny of your own business. For there can be no question about it—the best equipped shops are the ones that will produce more, earn more in the years ahead.

If your product involves the turning of metals, a systematic modernization program will keep your turret lathe department in fighting trim. Gisholt Engineers will gladly advise you.

*Look ahead... keep ahead...  
with Gisholt improvements in metal turning*

**GISHOLT MACHINE COMPANY**

1229 EAST WASHINGTON AVENUE • MADISON, WISCONSIN

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES



# 5-METHOD

## COMPLETE TOOL SERVICE for MAXIMUM PRODUCTION



● **STANDARD TOOLS** are complete tools, ready to use, in a choice of 10 styles, 3 grades, and many sizes — 164 tools in all. Ramet Carbide Tipped Standard Tools meet a majority of requirements for machining steel, cast iron, and all other materials, and are readily adaptable to special jobs.



● **MILLED AND BRAZED TOOLS** have a Ramet Carbide Blank brazed in place. All grinding is done by customer. Any size or shape of shank or grade of blank is obtainable in this classification.



● **TANTUNG "G"** offers the ultimate in increased production where cemented carbides cannot be used. It is available as standard tools in a wide assortment of sizes and styles.



● **BLANKS OF RAMET** Cemented Carbide of any shape, grade, or style all obtainable for the customer to make his own tools. A large variety of sizes in two styles and any of the three general purpose grades are available as standard blanks.



● **TOOLS TO ORDER** cover any style or shape of tool made to customer's order. Ramet Cemented Carbide Blanks are brazed in position and tool finished ground ready to use.

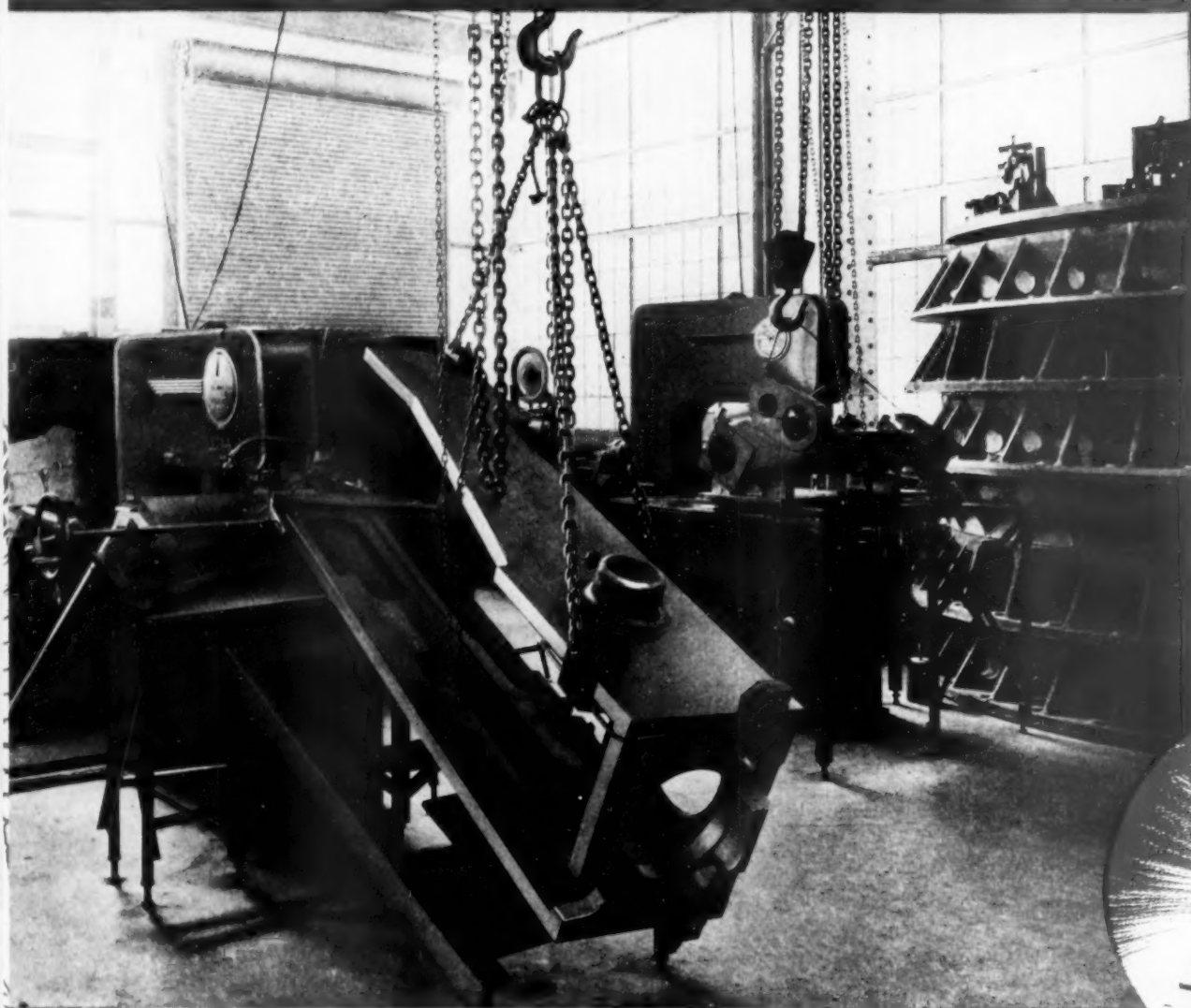
### VASCOLOY-RAMET CORPORATION

DISTRICT SALES AND SERVICE IN PRINCIPAL CITIES  
IN CANADA: Carbide Tool & Die Company, Ltd., Hamilton, Ont.

## THE SUPERIOR TANTALUM-TUNGSTEN CARBIDE TOOLS



# BIG GUNS BIG PRODUCTION



## ANTI-AIRCRAFT GUN SLIDE IN 1/3 FORMER TIME

Heavy Gun Slide has in position with crane and supporting fixtures to provide a 25" cut on a radius. DoAll cutting time—3 hours. DoAll investment, less than \$2,000. Former cutting time—10 hours on milling machine costing about \$45,000.



## THEN—WHEN PEACE COMES

Small and medium size plants, equipped with one or more DoAlls can accept profitable sub-contract defense orders for many parts. As soon as these orders stop, the DoAll can be immediately put to work catching up on shelved orders for civilian equipment for homes, shops and farms. The DoAll will not stand idle or have to be scrapped.

DoAll Machines with accessory equipment range in price from \$1,000 to \$5,000 complete. Prompt delivery. Don't delay another day—investigate DoAll possibilities for you. Wire or write.

\* Fastest precision method for removing metal.

Let us send a factory-trained man to your plant to show you how DoAll can save and make money for you, now and later.

NEW—Interesting and valuable book "DoAll on Production", free on request.



## CONTINENTAL MACHINES, INC.

1304 S. WASHINGTON AVE.

MINNEAPOLIS, MINN.

Associated with the DoAll Company, Des Plaines, Illinois, Manufacturers of Band Saws and Band Files for DoAll Contour Machines.

# DoAll<sup>★</sup> IS THE ANSWER

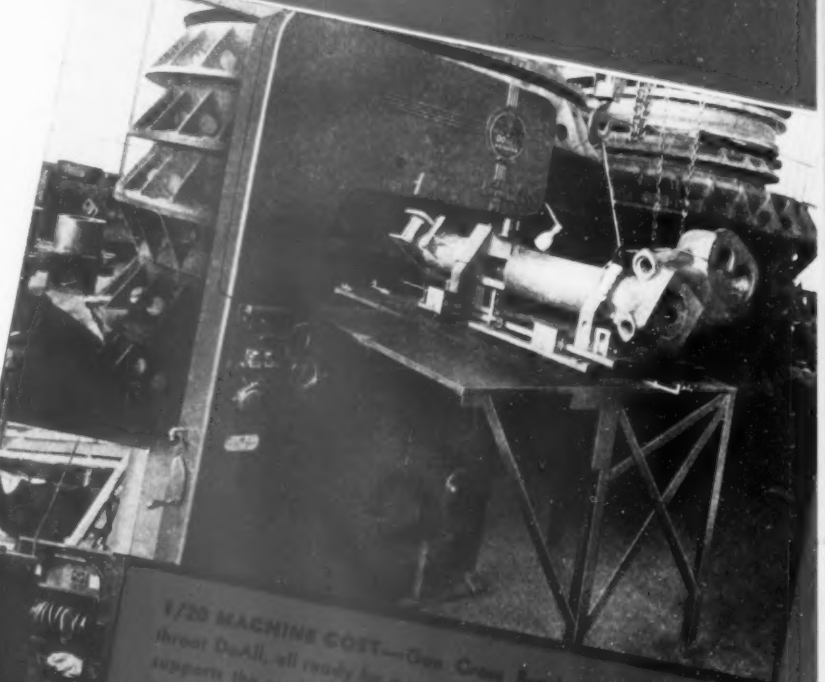
DoAll plays a leading part in production at the Northern Pump Company, Fridley, Minn., to speed up the delivery of \$200,000.00 worth of 5-inch Anti-Aircraft Guns for Battleships and Heavy Cruisers.

Batteries of DoAlls are used throughout the plant to do a lot of difficult operations on various parts for these guns. With the aid of special jigs, stands or hoists, the DoAll takes care of extra-heavy work formerly done on lathe, borer, broaching machine, drill, torch, cutter, shaper, nibbler and milling machines.

Savings of time are sensational and \$45,000 and \$50,000 milling machines are left free for other work.



**3 HOUR JOB IN 1/2 HOUR**—After the Bronze Gun Sight Covers for gun mounts have been completely machined to required dimensions, the machining lugs are trimmed off on the DoAll in 30 minutes. Former time, 2 hours on an \$18,000 vertical miller.



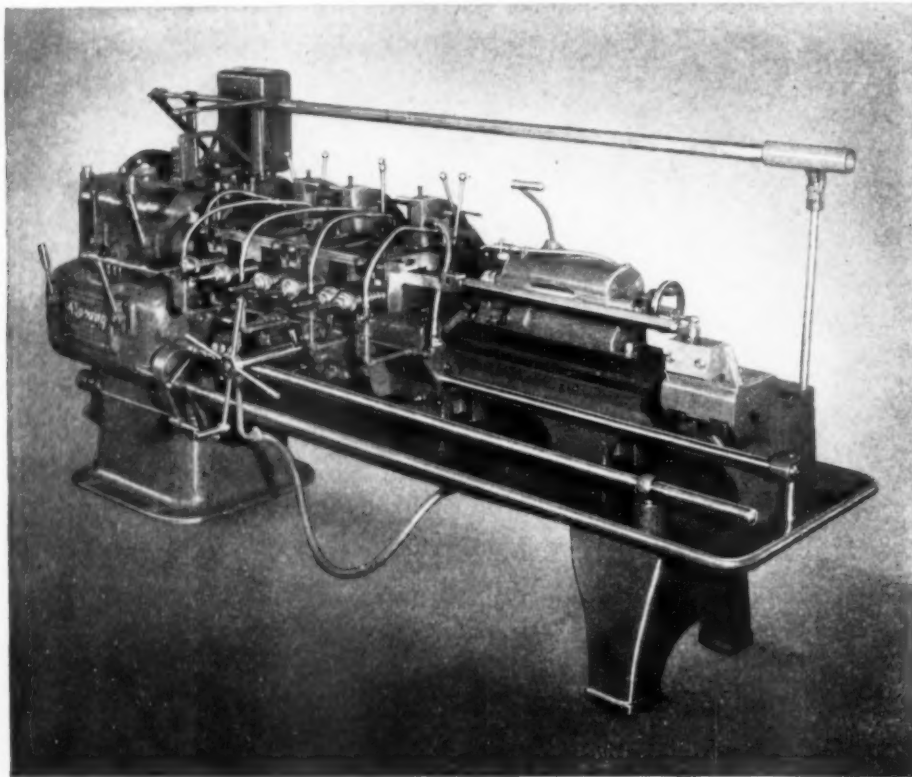
**1/20 MACHINE COST**—Gun Cross bracket is positioned on 40" throat DoAll, all ready for a parallel cut. Reinforced table and cross supports the work. This job was formerly done on a \$50,000 milling machine.

**DoAlls DOUBLE OUTPUT**—At the first machine, four Tension Bearing Racer are cut daily from a 4" thick drop forging. Outside contour shapes are turned and filed and no further finish is required. Formerly, only two of these were done each day on a milling machine. At second machine, Foot Filing Pedals for gun mounts are filed. At third and fourth machines, Control Valves for foot filing mechanisms are turned and filed.



# MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



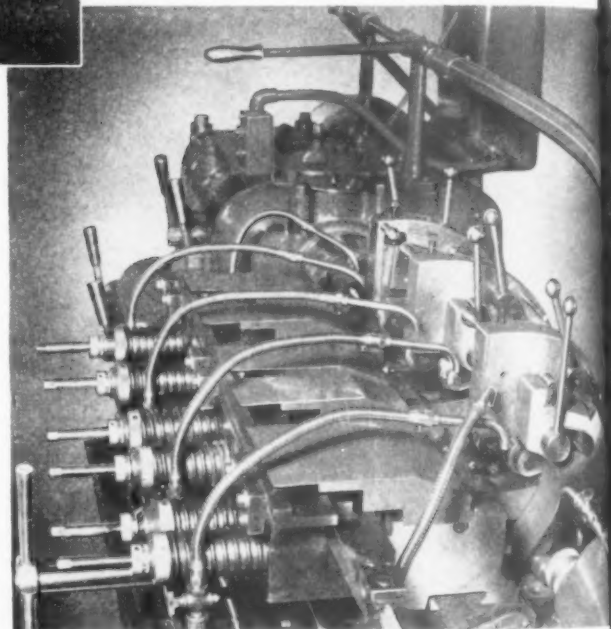
## 4" *Lo-swing* LATHE SOLVES TURNING PROBLEM ON MACHINE GUN BARRELS

Close-up view showing Steady Rest, template and tool relief construction.

**PROBLEM:** To provide a turning machine capable of fast production while taking heavy cuts on 50 caliber machine gun barrels.

**SOLUTION:** The standard 4" Lo-swing was chosen for this work for a number of reasons foremost of which were its simplicity and ease of operation by unskilled labor and its rugged, low-center construction which eliminates "stacked" cross-slides. Important, also, are the sturdy, all-steel, three-roll Back Rests, located on the rear shelf of the machine so as not to interfere with the movements of the longitudinal feed carriage. With this construction the gun tube is supported its full length while under cut. Cutting tools are controlled over the entire length of the cut by a two-step, hardened steel template which provides overlapping of the cutting tools and smooth, even blending of cuts. The template is machined to duplicate any form of barrel which may be required. Heavy, all-steel, Taper Attachment Tool Blocks are fitted with automatic tool relief to provide clearance on the return movement—avoiding all hand "cranking" of tools. The Tailstock spindle is equipped with a "built-in," revolving center which is absolutely necessary when sintered carbide tools are used.

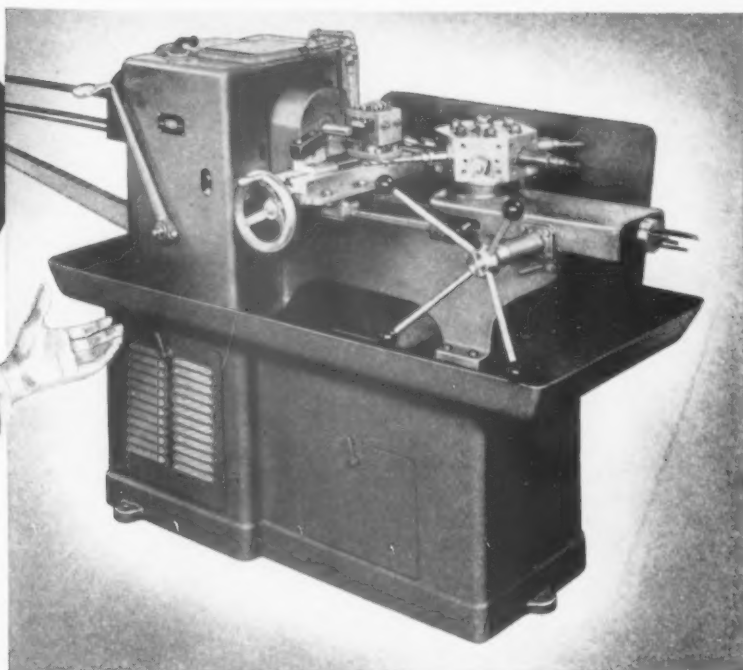
This 4" Standard Lo-swing Lathe, with multiple tooling and automatic tool relief is as efficient as an automatic lathe on this particular type of work and has the added advantage of simplicity and ease of operation and "set-up" by inexperienced labor.



## LATHE NEWS from SENECA FALLS



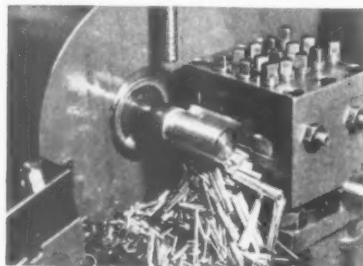
**IT PUT OUR SHELL  
CONTRACTS IN PRODUCTION  
IN RECORD TIME!**



## OSTER NO. 601 *Simplified* TURRET LATHE performs 1st and 2nd operation work on 20, 37 and 40mm shells



Oster No. 601 equipped with six position turret having six tapped holes in each face for mounting a wide variety of tool holders.



Heavy forming cuts are made possible by the smooth flow of power supplied by the WORM DRIVE. (For high speed work on small diameters and with non-ferrous metals, No. 601 is available with DIRECT DRIVE.)

Holders of shell contracts in the 20, 37 and 40 mm range are using batteries of Oster No. 601 Turret Lathes for 1st and 2nd machining operations. New men are trained rapidly, due to the **SIMPLIFIED** design and operation of the No. 601. Brief description of the machine follows:

Motor driven. Equipped with hand operated, six position turret; or with plain saddle (where the machine is required for three or fewer operations in sequence). Two types of drive are optional: **WORM DRIVE** (with spindle speeds from 143 to 1034 R. P. M.) **DIRECT DRIVE** (with spindle speeds from 900 to 3000 R. P. M.)

Automatic chuck capacity:  $1\frac{1}{2}$ " round bar;  $1\frac{1}{8}$ " square bar;  $1\frac{1}{8}$ " hex. bar. Swing over bed: 14". Swing over cross slide:  $6\frac{1}{2}$ ". Carriage travel: 11" when there is a cross slide on the 33" main ways. Maximum movement of screw feed cross slide is  $6\frac{1}{2}$ " and of lever feed cross slide,  $4\frac{1}{2}$ ".

**PRICE?** Under \$2000 (less tools). **DELIVERY?** From 10 to 12 weeks from receipt of order and priority certificate. Write for illustrated Catalog No. 27-A. An Oster Dealer is near you for quick cooperation.

**OSTER**

**Let's GO!**

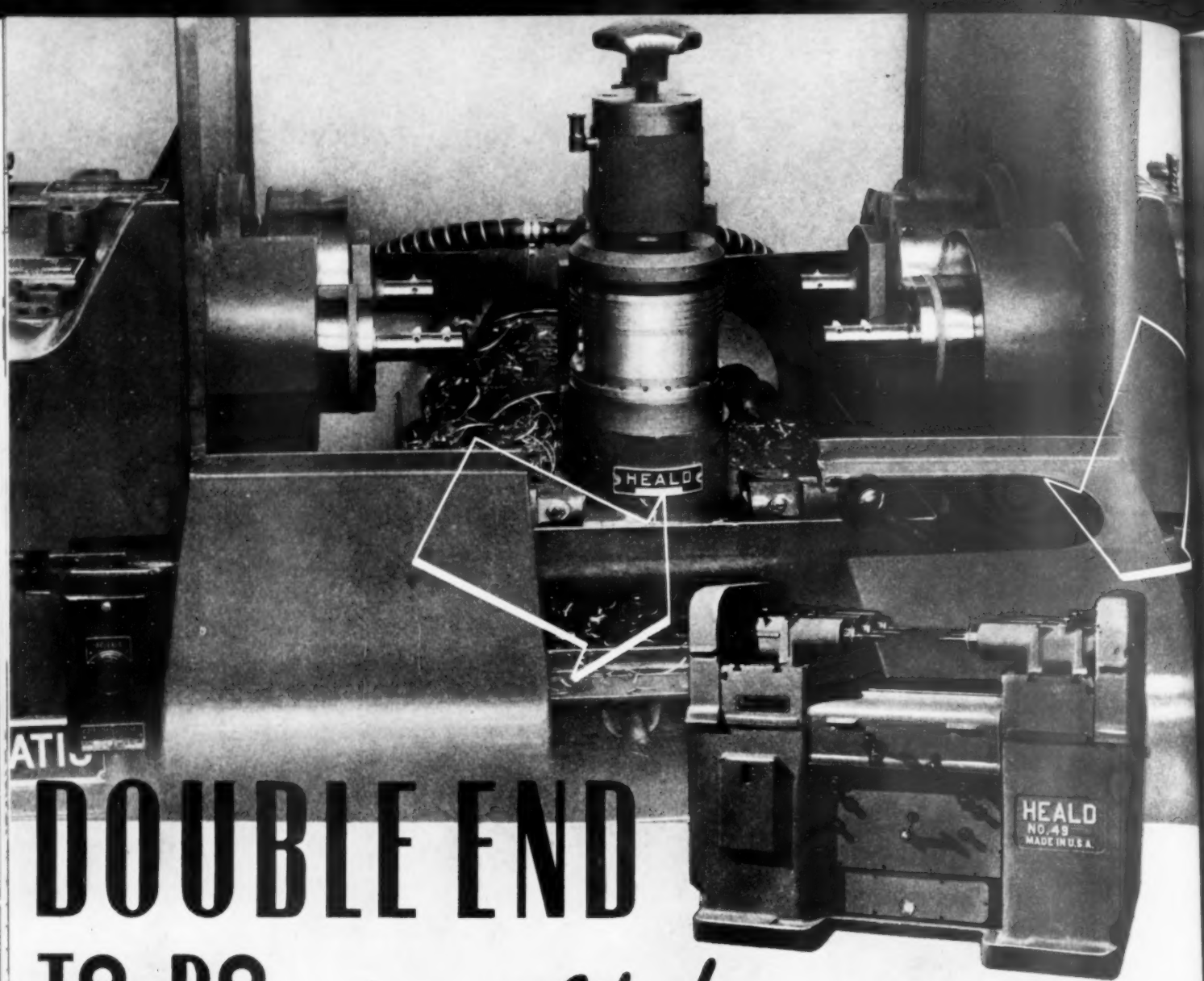
**THE OSTER MFG. CO. • 2063 East 61st St., Cleveland, Ohio**

Rush, by return mail ..... copies of Catalog No. 27-A which contains full description and detailed illustrations of No. 601 Turret Lathe.

NAME .....

ADDRESS .....

CITY..... STATE.....



# DOUBLE END

TO DO

*Twice as Much Work*

Double end Bore-Matics are built in three different sizes — Styles No. 45B, No. 46B and No. 49B — which enables selection of the right machine for every double end boring job. Illustrated above is a double end No. 49 Bore-Matic which bores and counter-bores both piston pin holes with front opposed heads and grooves pin holes with heads at rear.

TWICE as much precision work per cycle . . . that's exactly what can be accomplished on Heald Double End Bore-Matics . . . because these machines are arranged to perform boring-operations AT TWO ENDS by means of opposed boring heads and table traverse in both directions. Briefly here's what you can do on Double End Bore-Matics . . . bore multiple parts in a single cycle . . . semi-finish and finish bore one or more parts in the same setting . . . bore surfaces dead in line in opposite ends of one or several parts . . . perform a series of progressive operations on the same part or several parts. Heald Bore-Matics are available, too, as single end machines for boring from one end only. Altogether there are ten different styles of Heald Bore-Matics in both single end and double end types to exactly meet your requirements in precision finishing. Write, phone or wire us for complete details, today.

**BORIZE FOR PRECISION**

**THE HEALD MACHINE CO. WORCESTER, MASS. U. S. A.**

# KEEP THEM ROLLING ALONG

*Below left:—4" Type H Plain at plant of ball bearing manufacturer.*

*Below right:—4" Type H machine set up to grind outer raceways of inner ball bearing races.*

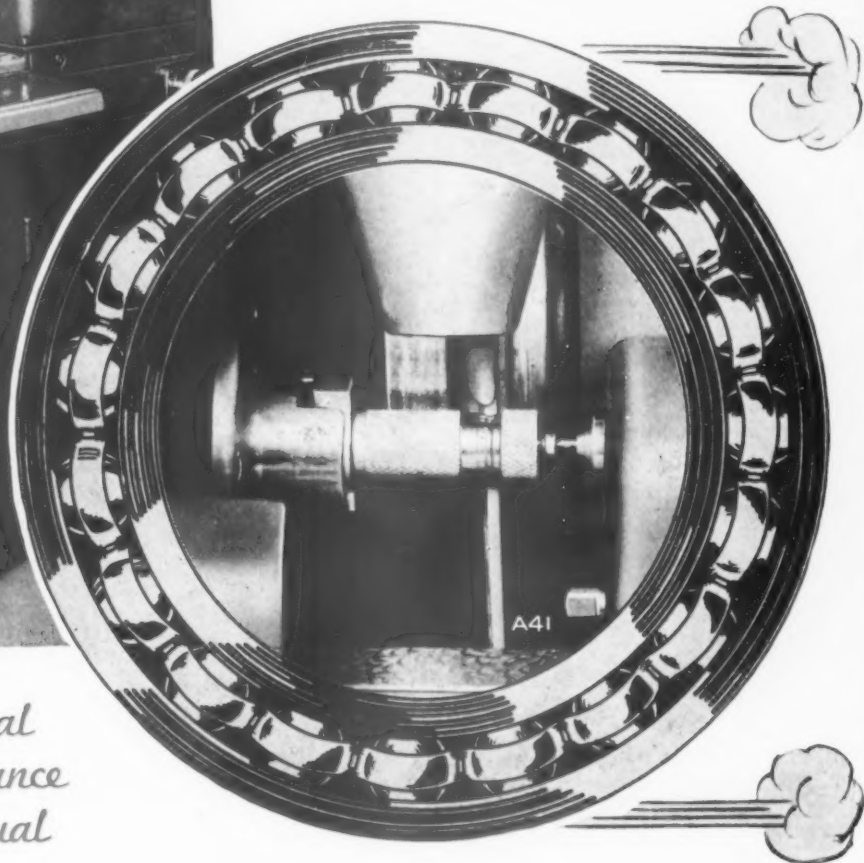


*A well-known ball bearing manufacturer is keeping his production rolling along by using a Landis 4" Type H Plain Grinder for the form grinding of the outer raceways of inner ball bearing races. The machine grinds 130 races per hour within limits of .0002" concentricity and .0005" diameter. Stock removal is .005".*

*Production like this is certainly not limited to ball races. In various plants throughout the nation Landis 4" Type H Plain Grinders are grinding such parts as micrometer barrels, chuck jaws, gun parts, odd sewing machine parts, camera parts, valve stems, pipe taps, airplane engine parts and many other parts within close precision limits at a high rate of production.*

*Why not keep your production rolling along with a Landis Type H Plain Grinder.*

184



*Unusual  
Performance  
As Usual*

## LANDIS TOOL COMPANY

WAYNESBORO  
PENNSYLVANIA



CYCLE  
CONTROL  
LEVER



VARIABLE  
VOLTAGE  
HEADSTOCK



MICROSPHERE  
WHEEL SPINDLE  
BEARINGS



MICROMETER  
WHEEL FEED





Keeping pace with the output of modern high-speed machine tools is the production obtained from Racine Hydraulic metal cutting machines in various private and Navy Shipbuilding Plants. One of these Racine Machines is shown in action at the Cramp Shipbuilding Company, cutting a 6" diameter grinding plug for a Naval valve. Features of the Racine design, which account for extreme flexibility, include a new hydraulic feed and single lever control of saw blade throughout the entire cutting operation. Either a positive progressive feed or a flexible feed may be engaged instantly and at will—both are controlled

by graduated dials for accurate settings. The machine illustrated has a table which swivels through an arc of 45° to obtain desired cutting angles, taking stock up to 10" x 13" for this class of work. Racine Saws are unequalled in the fast, accurate cutting of bar stock, tubing, special alloys and tough billet stock. They will make profits for you in increased output, better blade life and economical operation. Complete information on this model and all other Racine Hydraulic Metal Cutting Machines from 6" x 6" to 14" x 20" is listed in new Bulletins—Send for your copy today.

**RACINE** TOOL & MACHINE CO.  
1777 STATE ST. ... RACINE, WIS.

# Here's *ONE* "substitute" that's actually an improvement!

★ DBL High Speed Steel meets the tungsten supply situation and OPM orders. Although it contains less than  $\frac{1}{3}$  as much tungsten as 18-4-1, DBL fully replaces 18-4-1 in performance. It cuts as well or better in 85-90% of all cases — you won't lose a single minute's production. It heat-treats in the same equipment and by the same methods as 18-4-1, too—you'll have nothing new to learn, nothing new to buy. As a bonus value, DBL costs 16% less than 18-4-1 and weighs 8% less—you get more pounds per dollar, and more tools per pound.

Changing over to DBL High Speed Steel actually brings you advantages. Under free license, DBL is also produced by other tool steel manufacturers. Identify it by the following analysis:

<i>Analysis</i>	C	.75 — .85
	Cr	3.50 — 4.50
	W	5.00 — 6.00
	Mo	4.00 — 5.00
	V	1.25 — 1.75

THE DBL "BLUE SHEET" CONTAINS FULL TECHNICAL DATA... SEND FOR YOUR COPY

## ALLEGHENY LUDLUM

STEEL CORPORATION

PITTSBURGH, PA.

*Tool Steel Division*



*Watervliet, N.Y.*

### DBL HIGH SPEED STEEL



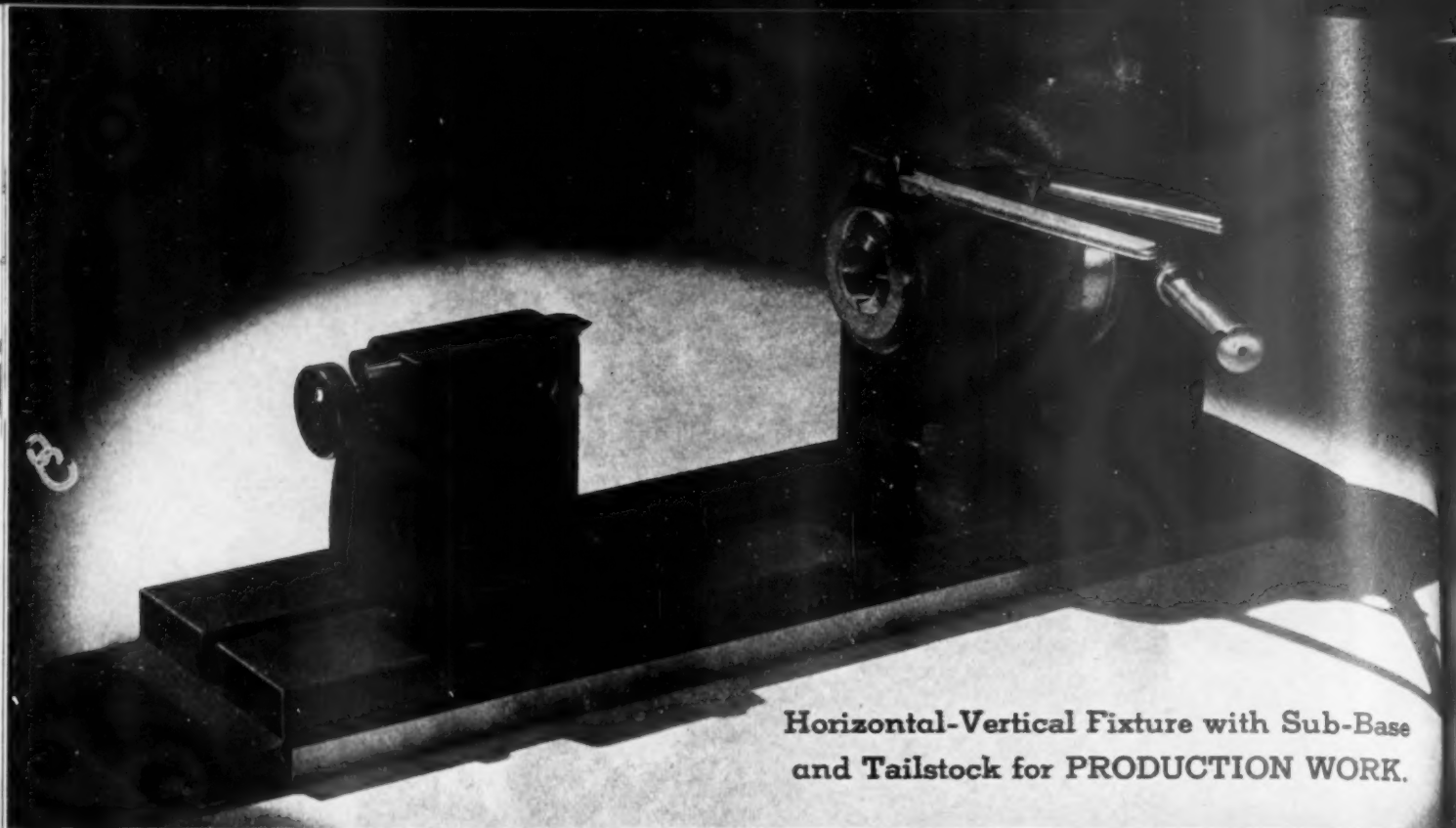
Allegheny Ludlum Steel Corporation T-213  
Oliver Building, Pittsburgh, Penna.

Send me a copy of the "DBL Blue Sheet."

NAME \_\_\_\_\_

COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_



Horizontal-Vertical Fixture with Sub-Base  
and Tailstock for PRODUCTION WORK.

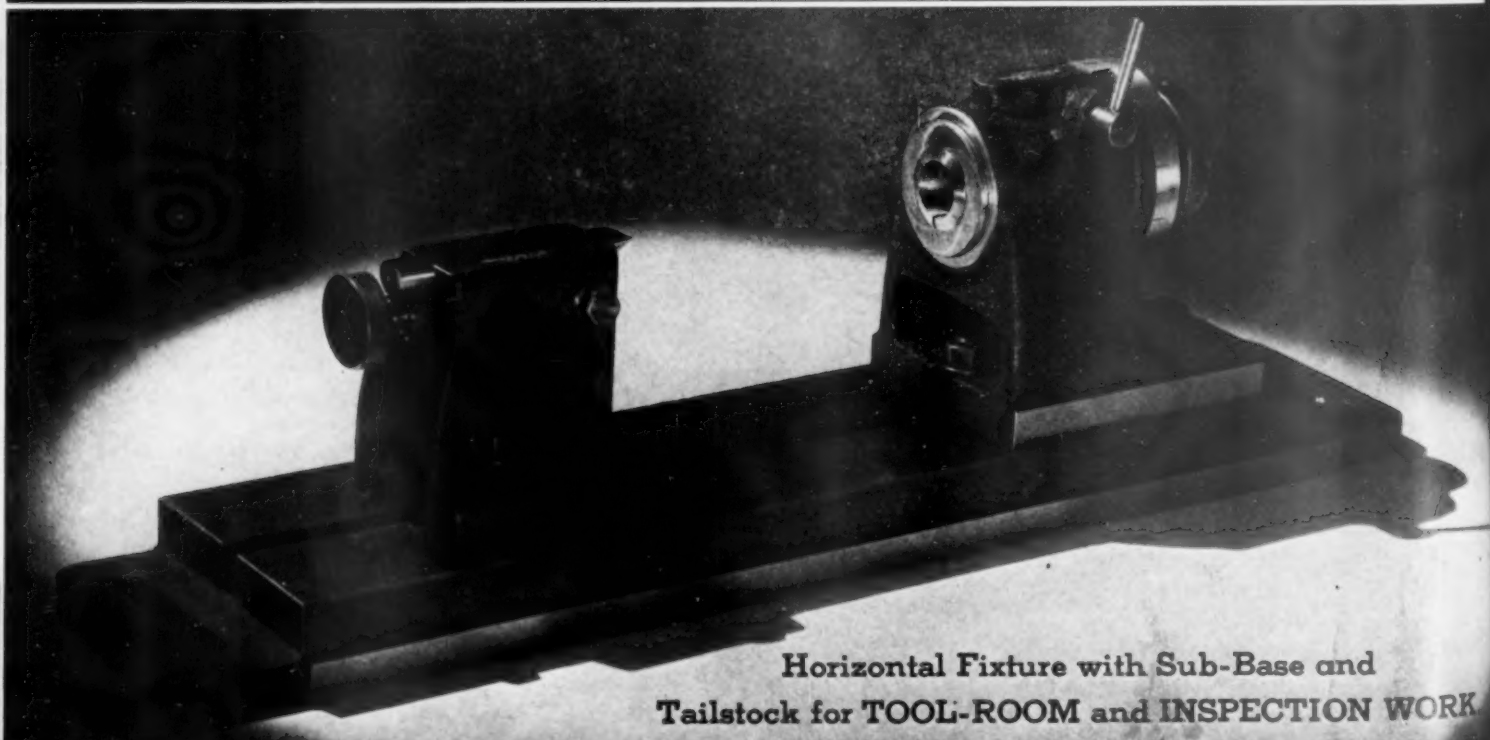
# HARDINGE *Collet Index Fixtures*

Ask for bulletin which describes many  
other features of these Hardinge Collet  
Index Fixtures.

When you use HARDINGE Collet Index Fixture units you will get more  
production from your old or new Milling Machines, Grinders, Shapers and  
Drill Presses. The 1" collet capacity, 20 or 24 hole index plate and 4" center  
height has a definite application to your second operation and inspection work.  
The index plate of the Horizontal-Vertical Collet Index Fixture has an arrange-  
ment whereby all holes may be "blinded out" except those required for a par-  
ticular job—this eliminates indexing errors.

Either fixture can be used individually, with the Tailstock, or with the  
Sub-Base as illustrated.

**HARDINGE BROTHERS, Inc. . . . ELMIRA, N. Y.**



Horizontal Fixture with Sub-Base and  
Tailstock for TOOL-ROOM and INSPECTION WORK



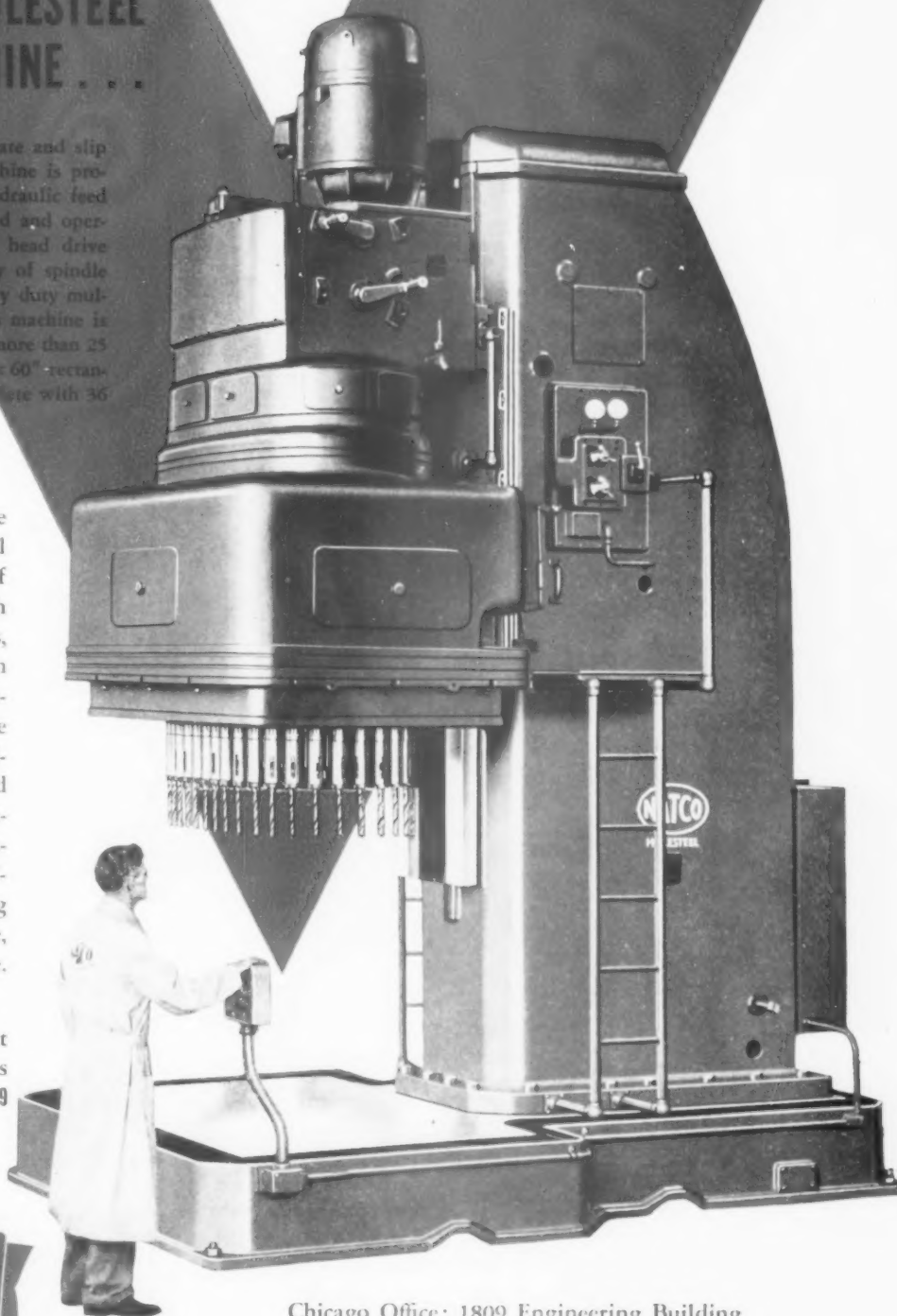
# NATCO

## MODEL B-6A HOLESTEEL VERTICAL MACHINE . . .

arranged with slip spindle plate and slip type spindles. This giant machine is provided with semi-automatic hydraulic feed which is electrically controlled and operated. It is furnished with a head drive which permits a large variety of spindle speeds ideally suited for heavy duty multiple drilling operations. This machine is 17 feet in height and weighs more than 25 tons. It is arranged with a 36" x 60" rectangular drilling area head complete with 36 adjustable spindle drives.

These NATCO machines are particularly adapted to general purpose multiple drilling of heavy work. They, along with other model NATCO machines, are playing an important part in the "all out" production for defense. Their adaptability to wide ranges of work, absolute minimum of cost of operation and maintenance, and ease of handling make them the ideal machines for HIGH PRODUCTION Drilling, Boring, Tapping and kindred operations. Write, wire or phone for representative.

For further information about these Giant B-6A machines  
**WRITE FOR CIRCULAR No. 519**



NATCO Advanced Engineering  
Plus Quality Construction  
Recognized For Many Years  
The World Over

Chicago Office: 1809 Engineering Building  
Detroit Office: 409 New Center Building

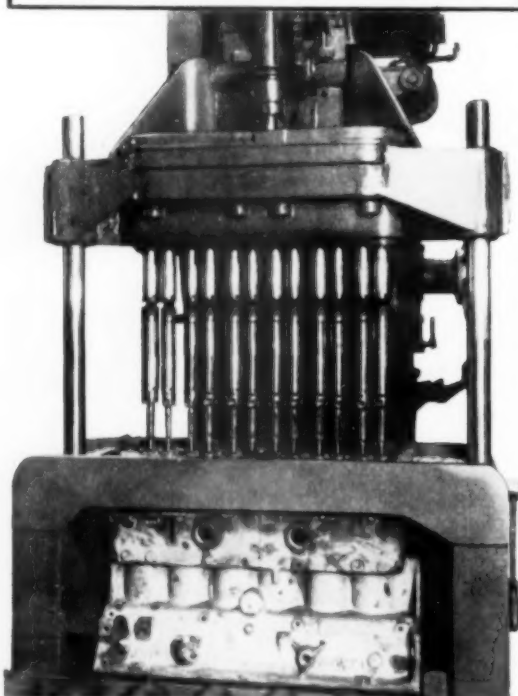


**THE NATIONAL AUTOMATIC TOOL CO., RICHMOND, IND.**

# Compensate for TOOL WEAR and UNEQUAL TOOL LENGTHS on single and multiple spindle jobs with MIDWEST ADJUSTABLE EXTENSION HOLDERS



MIDWEST ADJUSTABLE EXTENSION TOOL HOLDERS in use for FINISH REAMING Operation on Cylinder Blocks in a Detroit Automotive Plant



- ADJUSTMENTS CAN BE MADE IN STEPS OF .001 OF AN INCH.
- OPERATOR CAN MAKE ADJUSTMENTS BY HAND—NO TOOLS NEEDED.
- SET-UP TIME IS REDUCED.
- DESIGN IS SIMPLE, CONSTRUCTION RUGGED. ALIGNMENT ACCURATE.

## HERE'S HOW THEY WORK

Midwest holders are provided with an extremely accurate, ground fit between the sleeve and the shank. A knurled, graduated collar which controls the adjustment is located at the top of the sleeve. A key fixed in the sleeve, with a sliding fit to a keyway in the shank provide a positive drive.

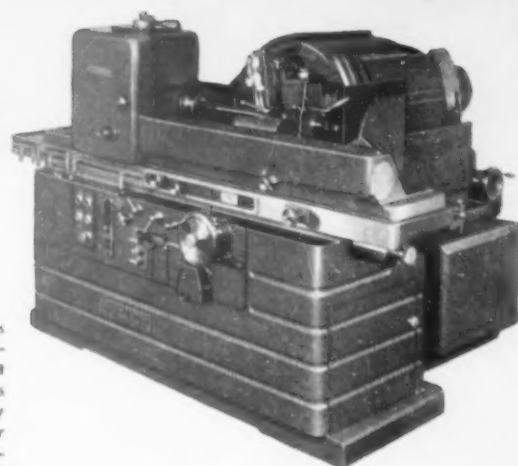
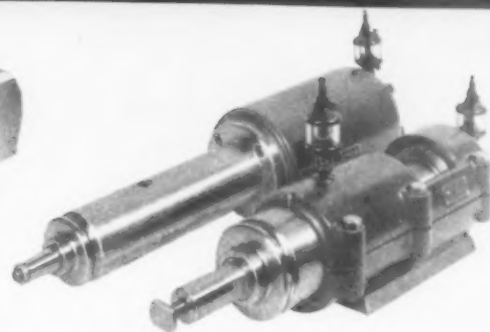
Micrometer, longitudinal adjustment steps of .001 of an inch are made by turning the collar one space on the bevelled edge, graduated scale. The collar holds firmly at all positions of the scale. There are no screws or locknuts to give trouble and, without tools of any kind, the operator can easily make the adjustment by hand.

**MIDWEST TOOL & MFG. CO. • 2364 W. Jefferson • Detroit, Mich.**

END MILLS • SLEEVES • COUNTERBORES • DRILLS  
SPECIAL TOOLS • REAMERS • FORM TOOLS  
CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

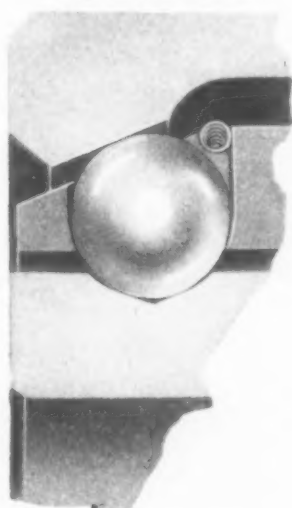
*Precision* METAL CUTTING TOOLS





ABOVE: Ex-Cell-O motor-driven and belt-driven types of spindles. BELOW: Close-up view of Ex-Cell-O Precision Ball Bearing. Through the arrangement of point contact between the ball and the race, each ball is given a gentle spinning motion that results in every part of the surface of each ball being presented for wear. This minimizes bearing wear and aids in maintaining the spherical shape of each ball. Ex-Cell-O Precision Bearings on Ex-Cell-O Spindles are interchangeable as a unit.

Precision Boring as universally used today was developed mainly through the availability of the Ex-Cell-O Precision spindle. Above is Style 1212-A, one of nine standard Ex-Cell-O Precision Boring Machines featuring the Ex-Cell-O Precision Spindle.



Thread Grinding Machines, producing work to extremely close limits, must have Precision Spindles. Above is Style 35 Universal, one of eight styles of Precision Thread Grinders made by Ex-Cell-O, all equipped with Ex-Cell-O Precision Spindles.



TO LEFT: Ex-Cell-O Style 44 Carbide Tool Grinder, equipped with Ex-Cell-O inbuilt balanced motor spindle mounted in Ex-Cell-O Precision Ball Bearings.

TO RIGHT: Ex-Cell-O Center Lapping Machine, Style 74, for accurately conditioning female centers. This Ex-Cell-O machine also features the Ex-Cell-O Precision Ball Bearing Spindle.



# PRECISION *begins with the* EX-CELL-O BEARING

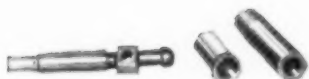
The greater accuracy, increased production, and better finish that a large number of manufacturers are obtaining today on Ex-Cell-O machine tools equipped with the Ex-Cell-O Precision Spindle can, to a great extent, be attributed directly to the superior features of the Ex-Cell-O spindle ball bearing—a bearing specially designed by Ex-Cell-O and precision fitted by patented Ex-Cell-O methods. For instance, many thousands of Ex-Cell-O grinding spindles with these special bearings are in daily operation throughout American industry—satisfactorily meeting all the demands made upon them by today's strenuous production pace. This is why many manufacturers of grinders use the Ex-Cell-O Precision Spindle as part of their original equipment, and why numerous metal-working plants throughout the United States insist upon the Ex-Cell-O Precision Spindle whenever spindle replacements have to be made.

EX-CELL-O CORPORATION • DETROIT, MICH.

THREAD GRINDING, BORING AND LAPPING MACHINES • TOOL GRINDERS • HYDRAULIC POWER UNITS • GRINDING SPINDLES • BROACHES • CUTTING TOOLS • DRILL JIG BUSHINGS • DIESEL FUEL INJECTION EQUIPMENT • R. R. PINS AND BUSHINGS • PRECISION PARTS







Airplane Engine Parts accurately honed to a super-smooth finish.



Aluminum Aircraft Link "produces high finish without bell-mouthing."



Gyroscope Balance Valve Body "saves production time in getting closer limits of accuracy."



Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."



Aircraft Valve Tappet Roller—.0003" stock removal to produce highly polished surface.  
Inner Bearing Ring "Accurately removes last 'tenth' of stock."



"A perfectly straight round hole with a mirror finish."



Drawing and Blanking Die "Saves time in producing smooth base metal finish."  
Drill Jig Bushing "Increases sales appeal of product."



"Produced an extremely accurate and glass-like finish."



## Sheffield Corporation of Dayton, Ohio Master Gagemakers —

—uses the Sunnen MA Precision Hone to remove .015" from the carburized surface of a .372" diameter hole 3 1/2" long in a Gaging Spindle. Machine is also used on cylindrical rings.  
Time saved over previous method — 50%.

## Solve your problems of accurately finishing internal cylindrical surfaces with the **SUNNEN Precision HONING MACHINE**

● Sheffield says Sunnen cuts time 50%. Other manufacturers handling important new orders report similar production increases. By using the Sunnen Precision Honing Machine to accurately grind and finish internal cylindrical surfaces from .185" to 2.400", many manufacturers have been able to release heavy internal grinders for other work. These manufacturers have been amazed to find that such an inexpensive piece of equipment can produce such accurate work. Accuracy is guaranteed to within .0001", and has often been held to within .000025" in production work.

Skilled or experienced operators are not required. Any intelligent workman can produce precision workmanship with only a few hours' practice. You can shift your highly skilled labor to other jobs.

Saves set-up time—the Sunnen Precision Honing Machine can be set up and work located ready for honing in less than one minute.

### Write for **FREE 8-page Bulletin**

This new bulletin will give you complete information—or if you prefer, a Sales Engineer will be glad to call with his demonstrator and show you what this machine can do for you on your job.



**SUNNEN PRODUCTS CO.**

7932 Manchester Ave., St. Louis, Mo. • Canadian Factory: Chatham, Ont.

# A New Steel *Perfected*—

## Just when You Need it Most!

# INGERSOLL D-B-L\* HACK SAW STEEL



*Produced under exclusive  
license arrangement with  
Allegheny-Ludlum Steel  
Corporation*

### Other Special INGERSOLL Sheet Steels include:

Alloy Steels  
Armor Plate  
Clutch Plate Steels  
Tillage Steels  
Soft Center Steels  
Shovel Steels  
Knife Steels  
TEM-CROSS Steel  
IngAclad (Stainless-  
Clad Steel)  
Stainless Steels and  
Saw Steels, including  
"18-4-1" and Molyb-  
denum and D-B-L  
Hack Saw Steels.

*Faced with the biggest job it has ever known, American  
Industry welcomes the timely development of Ingersoll D-B-L.*

With 18-4-1 restricted by the shortage of vital alloys, the problem of supplying hack saw blades that would meet every shop need became a serious one.

Ingersoll D-B-L is so high in impact resistance, provides so tough a cutting edge, and is relatively so free from decarburization, that when these advantages are added to its lower cost, there is every reason to believe Ingersoll D-B-L has found a permanent place in the modern shop.

Here is one substitute developed by necessity which may well become the prime metal for future hack saw blade use.

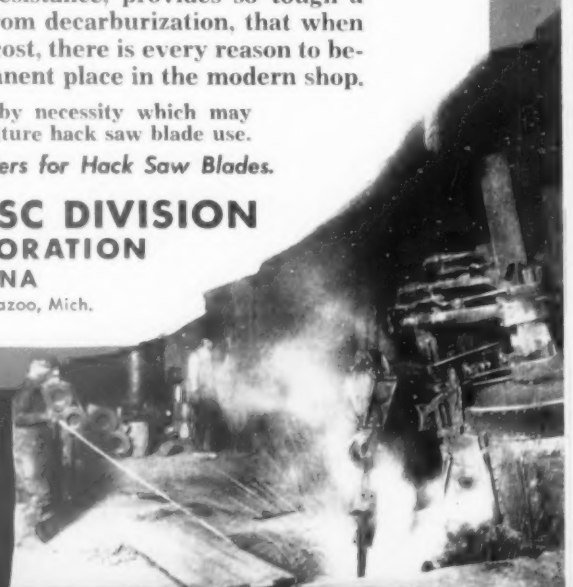
*Specify Ingersoll D-B-L Steel on orders for Hack Saw Blades.*

**INGERSOLL STEEL & DISC DIVISION  
BORG-WARNER CORPORATION  
NEW CASTLE, INDIANA**

Plants: New Castle, Ind.; Chicago, Ill.; Kalamazoo, Mich.

# INGERSOLL

**SPECIAL STEELS for SPECIAL USES**



# ★ "MORE PRODUCTION from each tool... *Double Quick!*"

... *That is the call* we must answer right now—double quick. Making tools that will give uninterrupted production for longer periods of time is a job that starts here in the steel mill and is completed in your tool room. It is a job that you and Carpenter can do best together.

Our job does not end with the production of quality *Matched Tool Steels*. Carpenter's help to tool steel users also includes complete metallurgical assistance. And it goes even further than that to include comprehensive printed material that simplifies the selection, heat treatment and use of tool steel for each job. Today, *your* job and *our* job is to—

*conserve* valuable metals  
*save* time in tool making  
*train* more tool makers  
*avoid* trouble in hardening  
*get* longer tool life  
*prevent* trouble on machines and presses  
*step up* machine output  
*cut* tool and production costs

As the foundation of Carpenter's program of *All Aid to Tool Steel Users* we offer "Tool Steel Simplified"—a handbook now being used in tool rooms, heat treating departments and machine

shops to make every pound of tool steel answer the call for *More Production—Double Quick*.

Over 22,500 copies of "Tool Steel Simplified" are helping tool makers and apprentices produce better tools that will do the work *more quickly*. Three chapters on heat treating equipment and procedure make this helpful handbook a high-priority need in every heat treating department. The chapter on "Trouble Shooting" is particularly helpful in quickly locating remedies for common tool troubles. "Tool Steel Simplified" also includes answers to questions like: "How to stop tools from warping?" and "How to make tools wear longer?"—along with a chapter on "Spark Testing" to help you identify tool steels that have lost their markings.

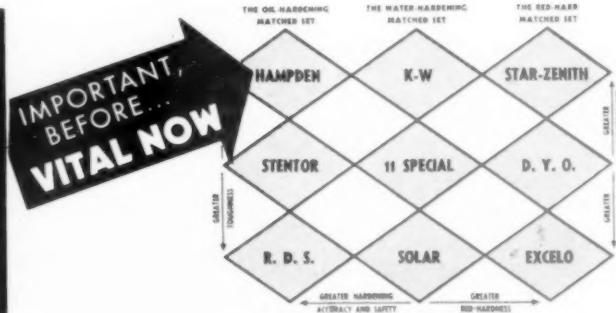
After you have read "Tool Steel Simplified," you will want each key man and every apprentice in your plant to have a copy of this helpful 315-page "refresher" course for tool makers and training help for new men on the job. "Tool Steel Simplified" costs only \$1.00 postpaid in the U. S. A. — \$3.50 elsewhere. Start now to put this useful handbook to work in your plant for *More Production From Each Tool—Double Quick*.



THE CARPENTER STEEL COMPANY

Dept. 41 Reading, Pa.

**Carpenter**  
**MATCHED**  
**TOOL STEELS**



THE TOOL ENGINEER



# WHAT IS PLAN-O-MILLING?



## HOW CAN YOU FIND . . .

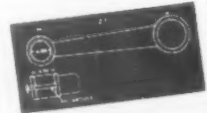
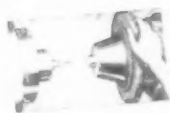
1. A better way of forming and thread-milling?
2. A machine that meets the closest tolerances easily?

## HOW CAN YOU GET . . .

A new inexpensive machine which, with specially designed fixtures, gives more parts per hour, a higher percentage of perfect parts, and lower cost per part?

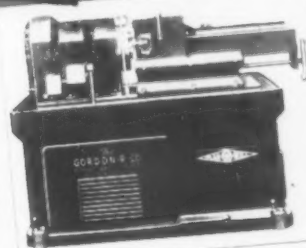
## THIS NEW FOLDER TELLS!

HOW PLAN-O-MILL



While Part Remains Stationary, Cutter Performs Work

TYPICAL PLAN-O-MILL FORMING OPERATION



SPECIFICATIONS AND CARE OF NO. 3 PLAN-O-MILL

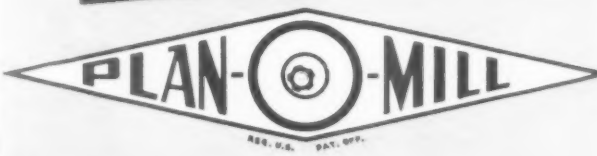
Capacity: 1/2" to 1 1/2" diam. parts  
 Speed: 100 to 1000 RPM  
 Motor: 1/2 HP, 115V, 60 cycle  
 Dimensions: 18" x 18" x 18"  
 Weight: 150 lbs.

4 FEATURES THE PLAN-O-MILL OFFERS

PLAN-O-MILL FORM and THREAD MILLING ENGINEERS DESIGN FIXTURES TO MEET YOUR NEEDS



SEND THIS COUPON



**The GORDON-R CO.**  
 627 WASHINGTON SQUARE BUILDING  
 ROYAL OAK MICHIGAN

THE GORDON-R CO.  
 627 Washington Square Building,  
 Royal Oak, Michigan.

YES—send me your new folder, "Just Push the Button".

Name \_\_\_\_\_

Title \_\_\_\_\_

Company \_\_\_\_\_

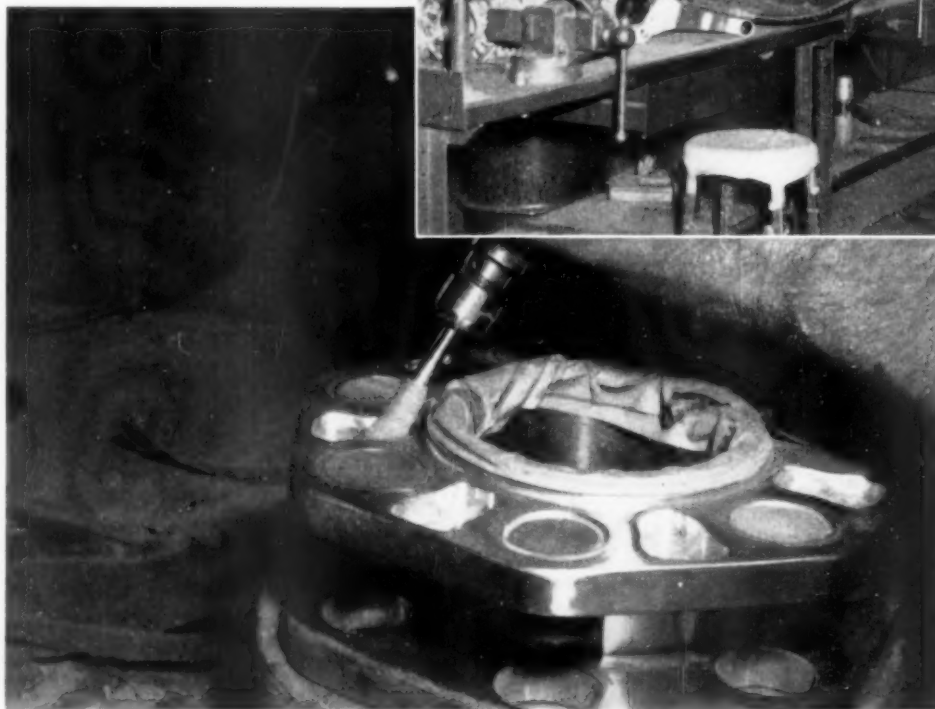
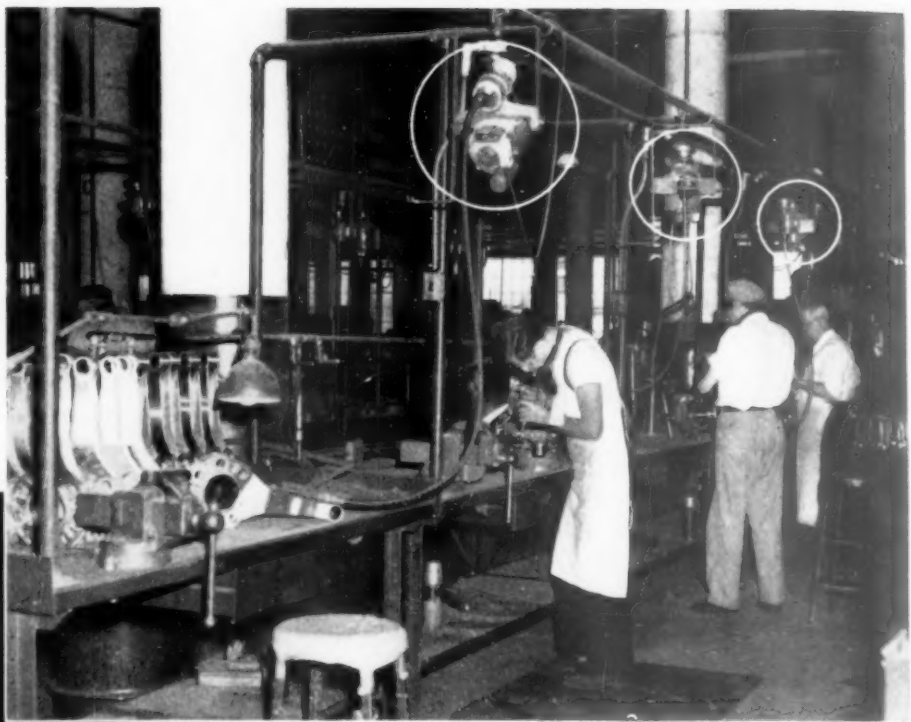
Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

# Jarvis

## POWER TOOLS

An exceptionally well-planned Jarvis multi-speed flexible shaft machine installation for polishing, sanding and rotary-filing of master rods.



Polishing of cavity in an aircraft engine master rod. Photos courtesy of Wright Airo. Corp.

**THE CHARLES L. JARVIS COMPANY**

TAPPING ATTACHMENTS

• FLEXIBLE SHAFT MACHINES •

GROUND ROTARY FILES

**Middletown, Conn.**

# BAKER DRILLS

BOX COLUMN HEAVY DUTY TYPE  
WIDE SPEED AND FEED RANGES  
ADAPTED TO THE ARMAMENT PROGRAM

## INTRODUCING

Model No. 150 Universal Quick Change Type, replacing the well-known model No. 121. General specifications are the same as No. 121, with the added feature of a wider speed range and twelve instantaneous quick changes of speed.

Speed range 48 to 1120 R.P.M. Furnished standard with one set of Pick-Off Gears giving a total of twenty-four speeds, 82 to 1120 R.P.M.

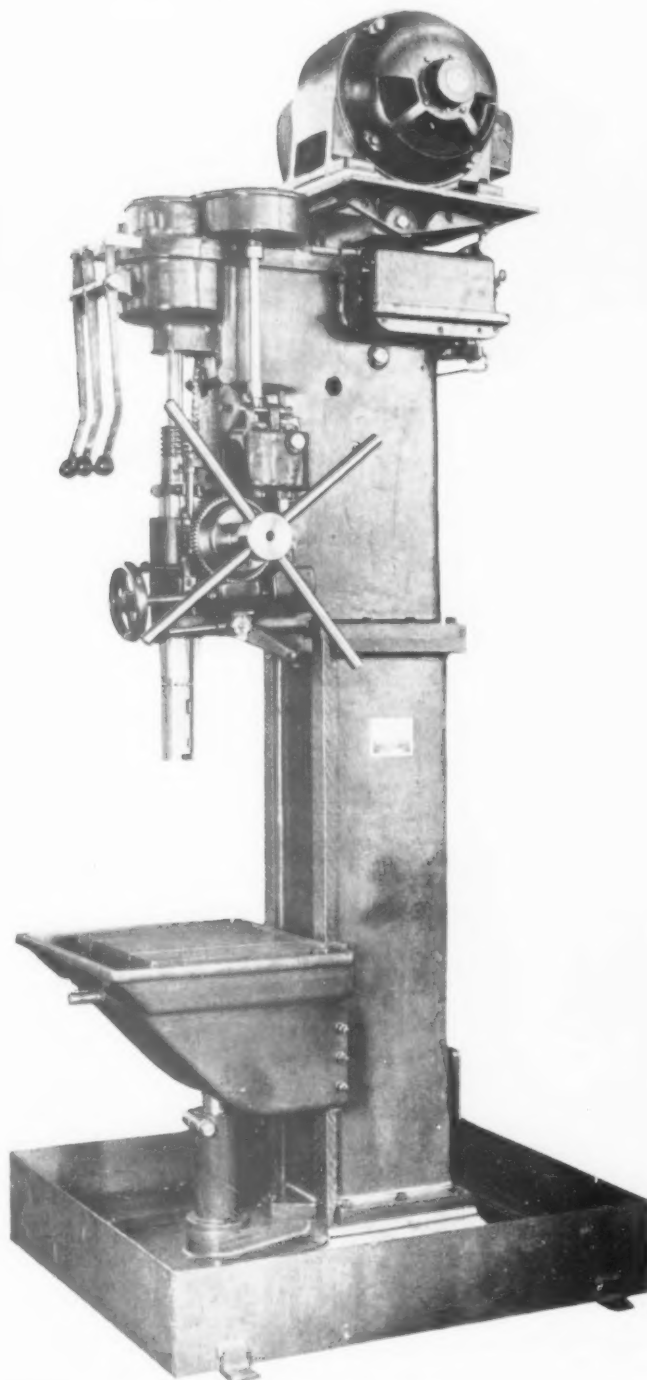
Multi-Vee Belt Drive.

Multi-Splined Spindle Drive.

Two-Piece Frame Design.

Capacity: 1½ inch Dia. Drill

In Solid Steel.



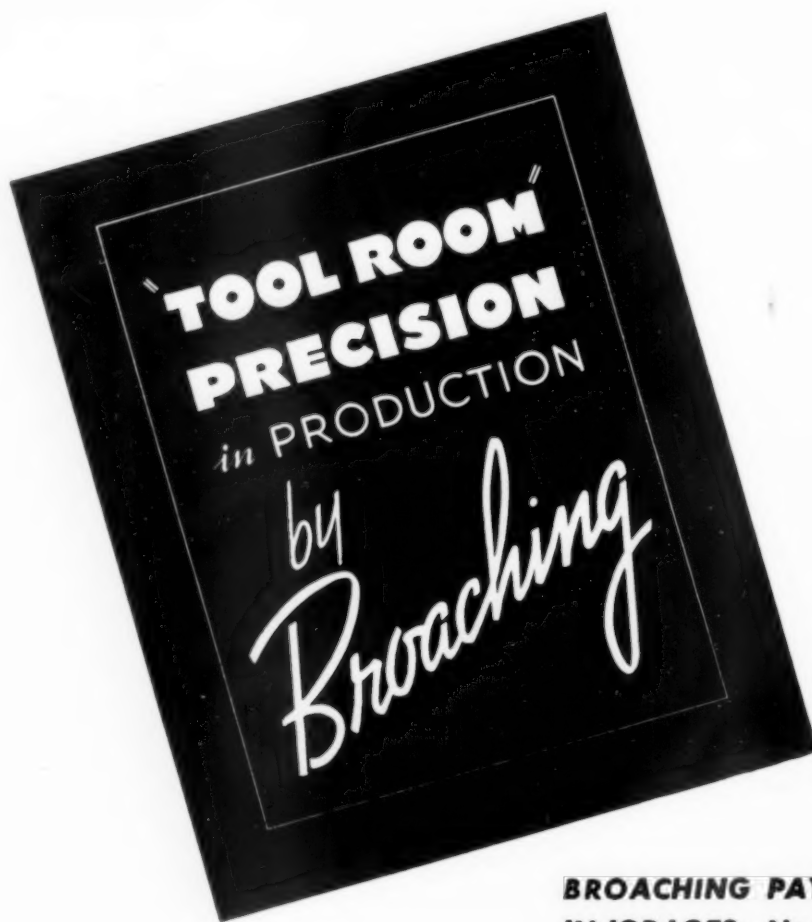
**A Very Flexible Machine For General Purpose Operations!**

WRITE FOR NEW CIRCULAR AND ENGINEERING DATA SHEET

**BAKER BROTHERS, INC. TOLEDO, OHIO, U. S. A.**

DRILLING - BORING - TAPPING - KEYSEATING - CONTOUR GRINDING MACHINES



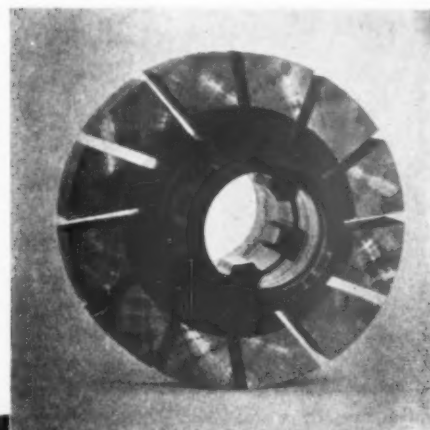


**THE JOB:** To put machining of pump rotor slots on production basis.

**THE METHOD:** Broaching two slots at a time in two passes.

**THE RESULT:** Lower cost per piece, fewer machines, tool room precision in production.

**BROACHING PAYS  
IN JOB LOTS..No. 5**



**F**ACED with the problem of stepping up rotor production for precision hydraulic pumps from a-few-at-a-time to a capacity of several thousand per month, broaching was found to provide the answer to low-cost production accuracy.

On a job-lot basis, these slots—only about 5/64 inch across—are held to plus or minus two and one half ten thousandths with greater ease and uniformity by broaching than it was possible to hold the same parts, a few pieces at a time, by milling.

Even if the job could be done as well, it would have taken quite a few milling and drilling machines to do the same job as the single two-broach equipped Colonial.



More details on this operation are to be found in the current issue of "Broaching News". We'll be glad to send you a copy. Ask for issue No. 10.

**COLONIAL BROACH COMPANY**

**147 JOS. CAMPAU ST.  
DETROIT, U. S. A.**

**THE TOOL ENGINEER**

# RUSH ORDER

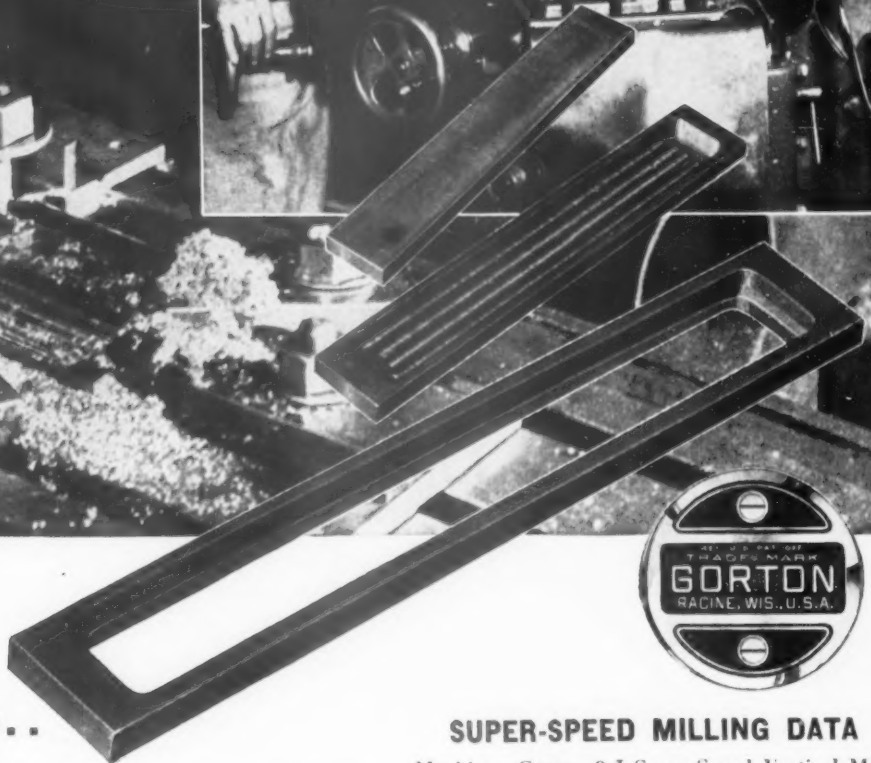
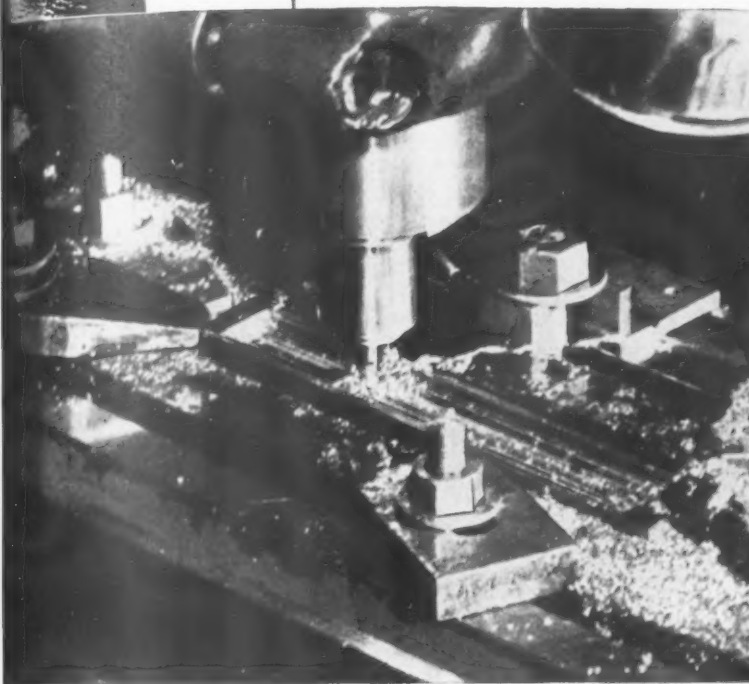
DATE ORDERED IN THE O  
CITY STATE ZIP

QUANTITY

12

PART

Steel Guard  
Frames Milled



## Here is a Typical Tool Room Job..

It was put on a Gorton 9-J Super-Speed Vertical Miller which is ideal for tool room Milling, Profiling, and also Production of small run rush work.

The machine is shown milling slots  $1\frac{1}{16}$ " wide x  $7\frac{15}{16}$ " long, in one of 12 steel guard frames for grinding machines at Barber-Colman Co., Rockford, Illinois. A  $\frac{1}{4}$ " diameter End Mill is hand fed using a spindle speed of 2200 RPM. Frames are milled complete in 2 operations— $2\frac{1}{4}$  hours Floor to Floor.

This is a typical Super-Speed Vertical Spindle milling job similar to a great many jobs found in any tool room. The Gorton Miller is exceptionally well adapted to work like this because of its many exclusive features, such as super-spindle speeds to 6000

RPM on standard machines and 17,500 RPM on special machines, permitting efficient use of small cutters. An adjustable Ram Type Head doubles table cross feeds, saves extra setups on large work, greatly increasing capacity of the machine. Moreover, this head can be raised by inserting raising blocks for increasing distance between spindle nose and table.

Possibly there are many small lot jobs in your tool room where this machine can be used to excellent advantage. Upon checking you may find, as others have, that this machine will do the work formerly required of two machines.

Gorton engineers specialize on Vertical High Speed Milling. Consult them without obligation.

## SUPER-SPEED MILLING DATA

Machine—Gorton 9-J Super-Speed Vertical Milling Machine.

Part—Guard Frame.

Material—S.A.E. 1020.

Quantity—12 pieces.

Cutter— $\frac{1}{4}$ " dia. End Mill.

Operation—Milling Slots  $1\frac{1}{16}$ " wide x  $7\frac{15}{16}$ " long, leaving  $\frac{3}{32}$ " step around inside of frame.

Holding—Simple clamping to table using "T" Slot bolts and clamps.

Feed—Hand.

Speed—2200 RPM.

Time—2 Hrs., 15 Min., (2 operations) Floor to Floor.

Finish and Accuracy—Good Finish — .005" Commercial Tolerances.

How to handle High-Speed Vertical Milling jobs is explained in Catalog 1300-A covering Gorton Super-Speed Vertical Milling Machines. **WRITE FOR YOUR COPY TODAY**



# GEORGE GORTON MACHINE CO.

1322 RACINE STREET, RACINE, WISCONSIN, U.S.A.

SPECIALISTS IN ENGRAVING DIE MAKING AND SUPER-SPEED VERTICAL MILLING

# An Expanded Line Of Standard Tools



## ...And A Revised, Simplified Price List

With new styles of standard cemented-carbide tools now carried in stock, Carbide Fabricators can promise prompt delivery of tools that will meet almost all your needs for turning, boring and facing jobs.

In addition, a new price list has been issued covering the entire Carbide Fabricators' line. Continuing our previous methods of pricing, one low unit price prevails for tools ordered in any quantity. This simplifies purchasing routine for every customer, and no cost penalty is imposed on any concern desiring to order these tools in the smallest quantities.

It's to your advantage to have full information at hand on these and special types of tipped tools manufactured by Carbide Fabricators—a division of Morse Tool Company occupying a separate modern plant devoted entirely to producing top quality cemented-carbide tools.

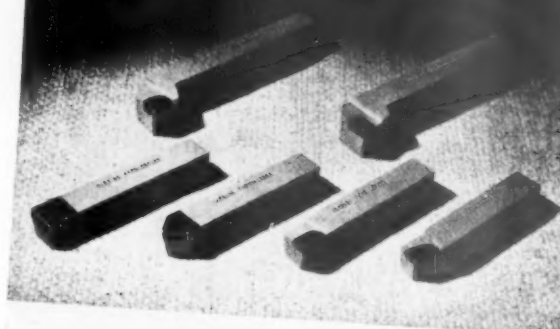
AS MANY COPIES OF THIS NEW CATALOG AS YOU REQUIRE will be mailed to you directly from the factory or may be secured from the following Sales Representatives. Your requests will receive immediate attention.

**C. D. PROCTOR**  
30 Church St., New York, N. Y.

**DONALD ROBERTSON**  
549 W. Randolph St., Chicago, Ill.

**PURCELL BROTHERS**  
626 Broadway, Cincinnati, Ohio  
**HUGE-FAYLE SUPPLY CO.**  
1905 Caroline St., Houston, Texas  
**G. R. WALL**, 71 Leroy St., Buffalo, N. Y.

## STANDARD TOOLS for General Shop Use



Supplied In A Simplified  
SIZE and PRICE RANGE

**Carbide Fabricators**  
BERKLEY MICHIGAN

Represented by

Division of  
**MORSE  
TOOL CO.**

We are authorized suppliers of Carboloy, Firthite and Vascoloy-Ramet cemented-carbides.



**Carbide Fabricators**

**BERKLEY  
MICHIGAN**

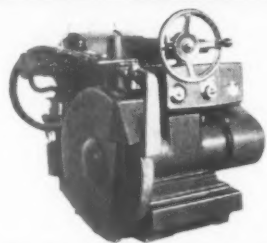
DIVISION OF MORSE TOOL COMPANY • DETROIT



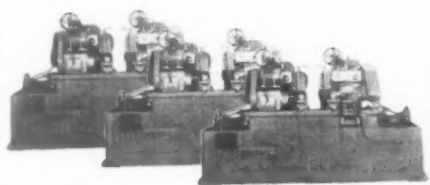


## *How to Cut* **TOMORROW'S COSTS**

*with the Grinders you buy today*



**SINGLE BOWGAGE UNIT**



**3 DOUBLE MACHINES**

**TODAY**



**TWO-3-HEAD MACHINES**

**TOMORROW**

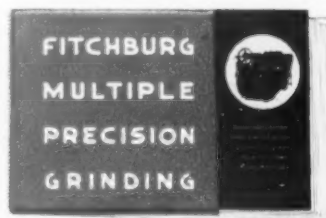
FITCHBURG'S low cost method of mounting standard Bowgage Head Grinding Wheel Units to multiple grind special jobs will earn more profits for you in the present market, and leave you in a position to make rapid changeover later.

All Fitchburg Bowgage Head Precision Grinding Wheel Units are standard and interchangeable. If any operation is discontinued the heads can always be used elsewhere—either on standard machines or regrouped and remounted on other multiple head machines.

This feature protects and prolongs the useful investment life of your Fitchburg equipment.

Save time and money—speed up cylindrical production grinding with Fitchburg Bowgage Heads.

*This book shows how  
to cut grinding costs  
... write for it today  
... it is free to executives*



# **FITCHBURG**

**GRINDING MACHINE CORP.**  
FITCHBURG, MASSACHUSETTS, U.S.A.

# RIFLING

## 40MM BOFORS



AMERICAN has produced machines for broaching the rifling grooves in 105 MM Howitzers and 20 MM cannon barrels at higher production rates than have previously been possible. With present demands for more rapid production of other size cannon AMERICAN has now produced the machine shown in the lower left cut for producing rifling grooves in 40 MM Bofors barrels. The machine is an AMERICAN 10G hydraulic gun rifling machine having 100" stroke.

All grooves in the barrel are cut simultaneously on an accelerated helix. The grooves are each approximately .020" deep.

The gun barrel is clamped between split bushings for the rifling operation, two locating diameters having been previously turned on the barrel for this purpose. A set of 30 individual cutters is then pushed through the barrel in sequence, each cutter removing slightly more stock from all grooves than the preceding cutter. Lubricating oil is forced through the barrel under high pressure during the complete broaching operation. Production of one complete barrel per hour is obtained with this machine.



**AMERICAN BROACH & MACHINE COMPANY**

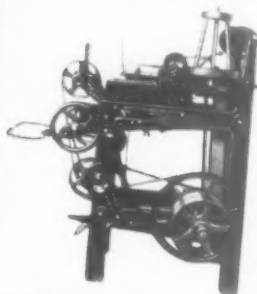
ANN ARBOR, MICHIGAN, U. S. A.

BROACHING MACHINES, PRESSES, BROACHING TOOLS, SPECIAL MACHINERY



# *Adapting* Invention and Designing Skill to Primary Industrial Needs..

*A half century ago the inventive resource and designing skill of the Lipe organization blazed the way for many industrial ventures. For instance...*



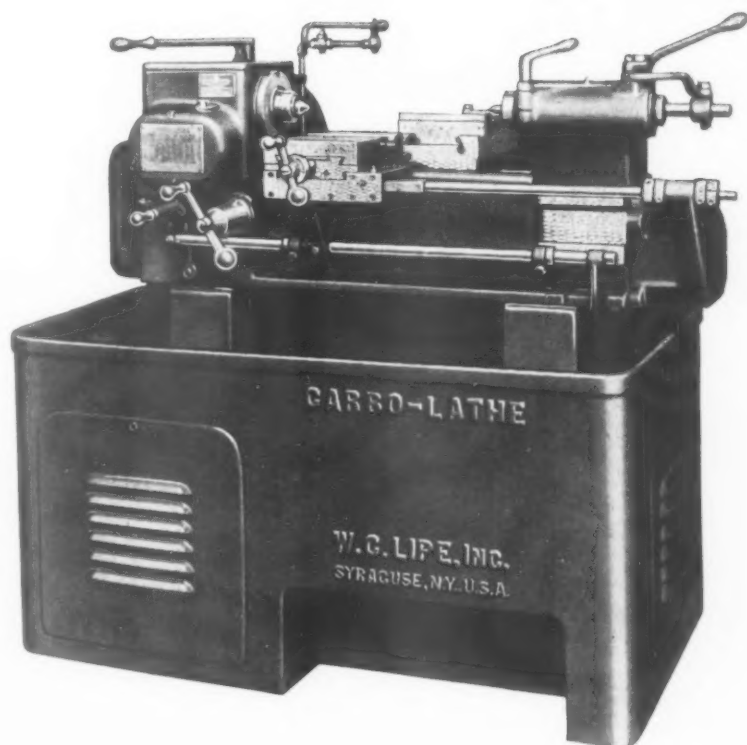
## IN 1879 LIPE made this BROOM-WINDING MACHINE

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# LIPE CARBO-LATHE

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- Lipe engineers were quick to sense the possibilities in carbide and diamond-tipped tools. They built this super-fast, super-rigid Lipe Carbo-Lathe especially for these fast-cutting tools... especially to "hog off" tough steels to "rough grinding" tolerances.

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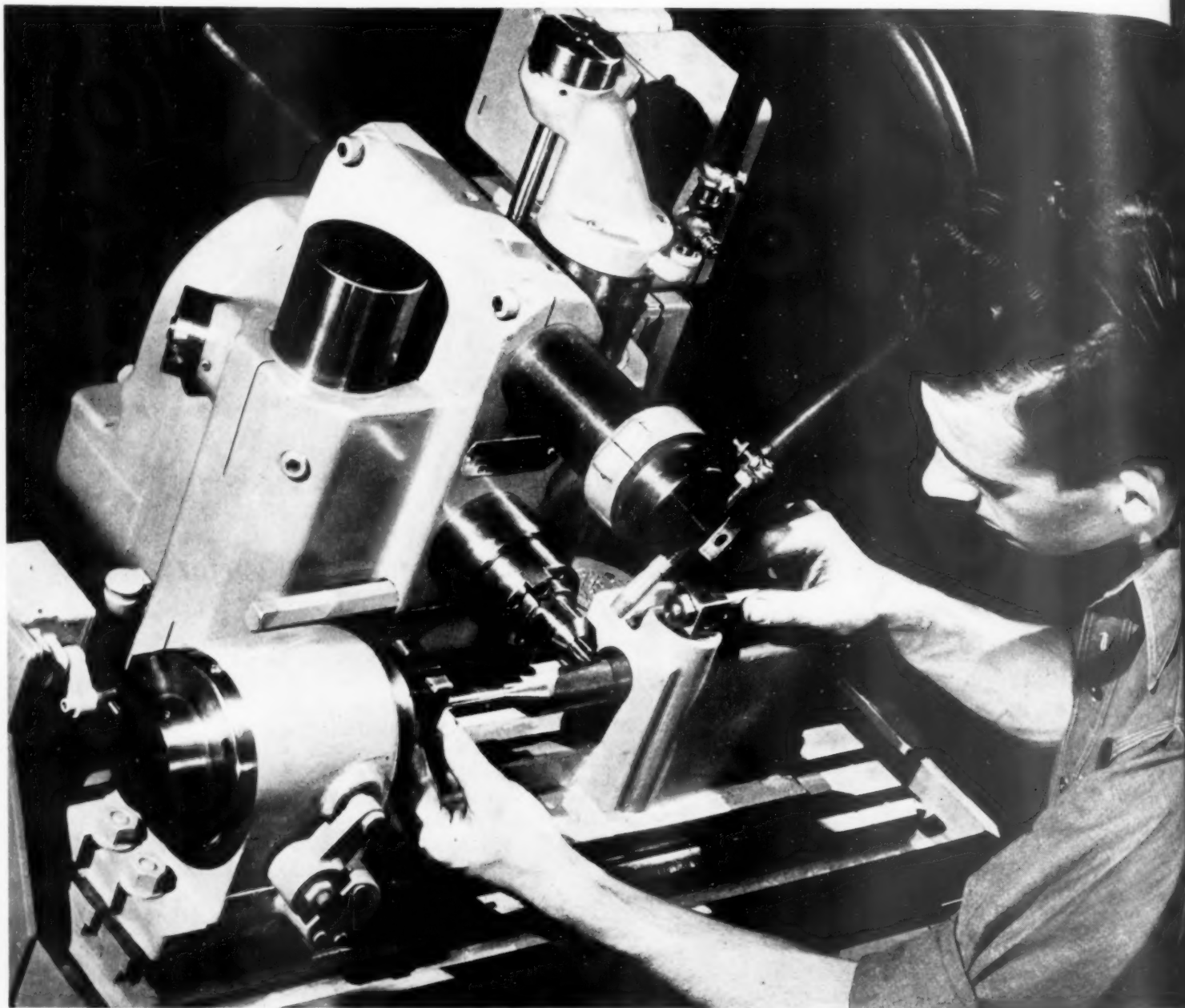
Lipe Carbo-Lathe not only boosts production, it boosts profit on the increased production. Write now for specifications and detailed description.



**W.C. LIPE, INC. Syracuse, N.Y., U.S.A.**



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**PRODUCTION *plus accuracy***  
**WILL WIN THIS WAR** ★ ★ ★ ★ ★



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Production will win the War... *But ACCURACY cannot be sacrificed!* And everywhere experienced shop men are calling on Kent-Owens for milling machines to do the tough jobs. Kent-Owens Milling Machines are *rugged... simple... efficient.* They provide the advantages and features that practical men want. Send for Bulletin... Kent-Owens Machine Company, Toledo, Ohio.

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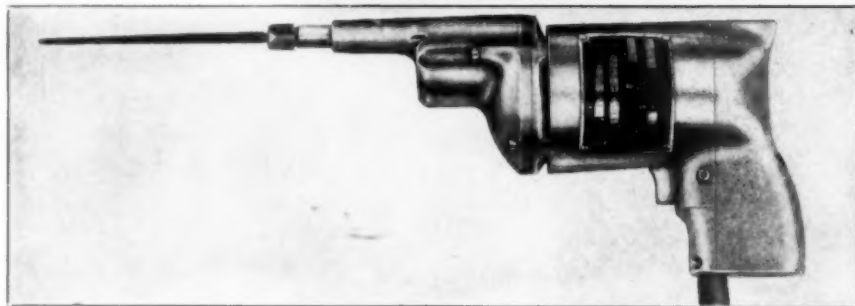
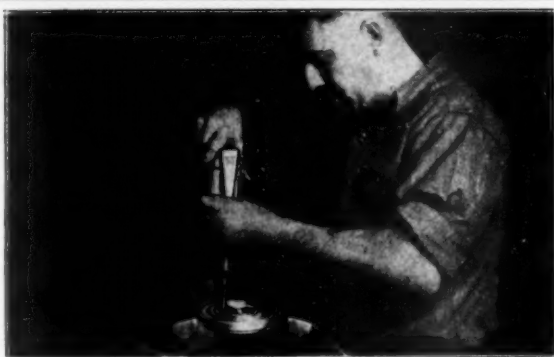
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**↑ VALVE MANUFACTURER SAVES FILES** as well as time filing valve disc guides with flat file in Reciprocating File. Workmen develop new positions for holding work and saving time.

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**↑ ONLY 10-1/4" LONG** and weighing only 4 pounds, CP Reciprocating File is an easy-to-handle production-increasing tool. Particularly useful for cleaning small die castings.

**ANOTHER SPECIAL PURPOSE** tool is the CP → 800 Universal Electric Scaler, a time-saver for cleaning electric welds of flux scale, cleaning firebrick, vibrating small moulds.

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**Time Saver on Castings**

**NEW YORK**—Plants in all parts of the country are effecting substantial production increases with the CP Universal Electric Reciprocating File. A company using the Reciprocating File for trimming around turbine blades reports a speed-up of 50%. A manufacturer employing the Reciprocating File for dressing up gun metal plate valves is now finishing three valves to the one previously filed by hand. The Reciprocating File is proving a time-saver in cleaning all types of steel and iron castings and in finishing die cavity work.

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Often a slight departure from the standard practice means real tapping efficiency where formerly trouble was experienced. Let us try to show you what our long and varied experience has taught us about tap manufacturing, design and use. Such service is available without obligation.



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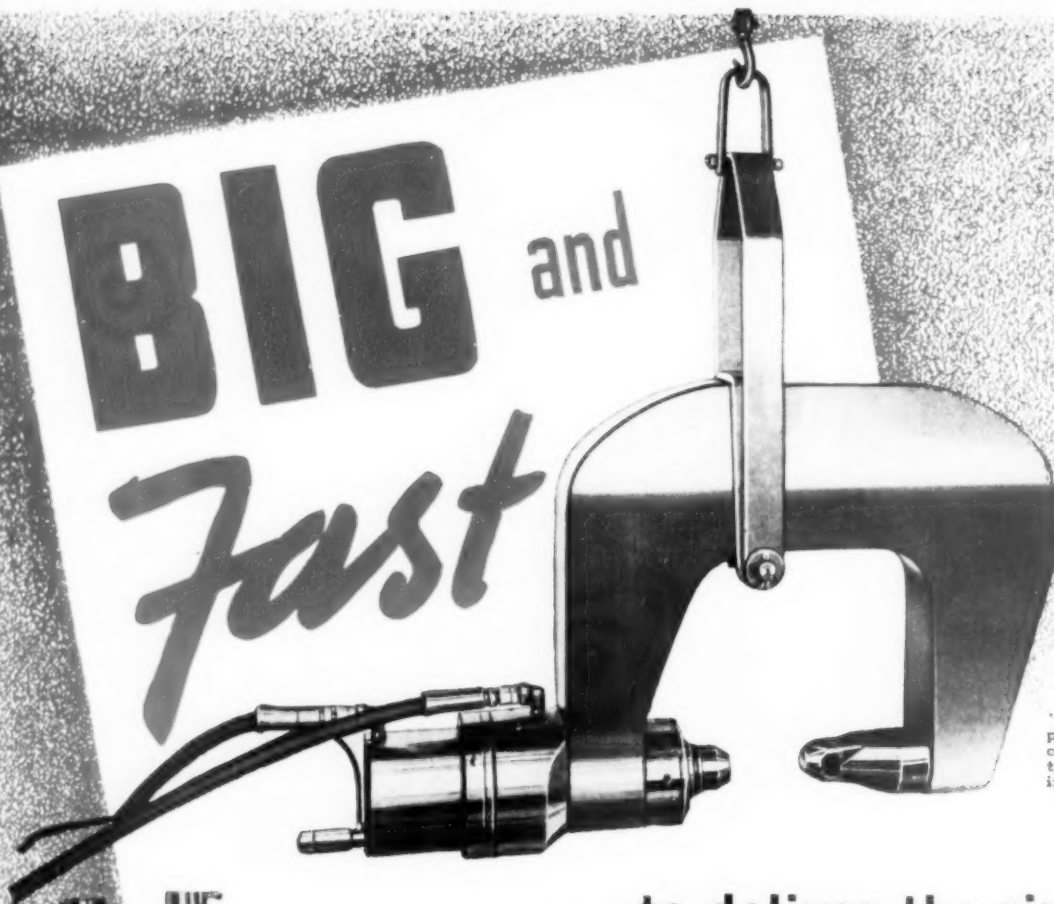


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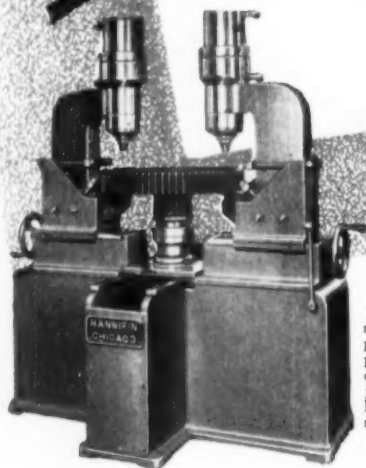
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"Hy-Power" portable riveter, capacity 100 tons, reach 17 in., stroke 5 in.



"Hy-Power" stationary duplex riveter, capacity 75 tons each unit. Adjustable to handle various sizes of work.

## .... to deliver the riveting performance that matches today's production needs

Hannifin "Hy-Power" Hydraulic Riveters deliver the fast, easily handled riveting that keeps pace with the increasing speed of modern production operations. The 100 ton capacity portable riveter and the duplex 75 ton stationary unit are recent examples of Hannifin "Hy-Power" equipment built for specific needs of armament production. The "Hy-Power" hydraulic operation, originated and perfected by Hannifin, combines the high speed, automatically completed riveting cycle with ease of operation and control, and simple handling of work, to deliver sustained riveting production. The push button controlled "Hy-Power" cycle includes: 1. Rapid advance stroke, 2. Automatic high pressure working stroke, 3. Automatic reversal at maximum pressure, 4. Rapid return stroke. Reversal at maximum pressure governed by work resistance contributes to better, more uniform riveting, and provides automatic compensation for variations in rivet length within the capacity of the unit.

Write for Bulletin No. 53 with complete data on Hannifin "Hy-Power" hydraulic equipment for riveting, punching, pressing, press-fit assembly, forming, multiple unit punching and riveting, and similar work.

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Telephone Columbia 4949

While National Defense needs are taking most of our greatly enlarged plant capacity, we will continue every possible assistance to users of Hannifin production tool equipment. Standard types of Hannifin hydraulic and pneumatic equipment may be modified to meet individual needs, avoiding delays due to special design. Hannifin engineers will give you specific recommendations.

# HANNIFIN

# "hy-power"

## RIVETERS PUNCHES • PRESSES



## *Multiplying Man Power*

**T**OOL ENGINEERS must increase our man power to achieve the goal set for us. Tool Engineers have had to bear the brunt of criticism for delays in defense production plans although production men, who know, claim it was lack of delegated authority in Washington that caused them. We hope that the recent changes in Washington will greatly improve this situation.

Following "Pearl Harbor," the President as Commander-in-Chief set our goal for 1942—60,000 fighting planes, 45,000 tanks, 20,000 anti-aircraft guns, a ship a day on each coast and thousands of other military vehicles. Never in the history of this or any other nation has such a tremendous new manufacturing project been required in one year. More than doubling production in a year is a superman's job in anybody's language. The plan calls for an increase of a billion and a quarter for aircraft, a billion more for tanks, two billion more for military trucks and combat vehicles and a billion more for guns. New machines can't be built fast enough to do such a job in the time allotted. Changing over the automotive industry from civilian to defense activity may be one answer. These changes mean a tremendous job of making new tools and conversion of old equipment. Never before have Tool Engineers had such an opportunity to show their Engineering skill, their ingenuity, their ability to speed up production and increase man power.

Already one manufacturer is converting big cylinder block multiple head milling machines to machine tank turrets.

The newly organized Automotive Council for War Production is surveying all automotive shops to find out what tools are available. Representatives from 1400 concerns are working with Army and Navy men to plan ways and means of loading every new and converted machine with essential war work. Arrangements are being made to lease or sell any machines or tools which are not being used by the owners for war work.

Eighteen men are required today for each trigger man in the field. You, as Tool Engineers, have got to cut that ratio down—you have got to devise ways to get greater production per machine or we will never be able to reach the goal of eight million men in the field. To do that would require 144 million men and that's more than the population of this Country.

What Fred Zeder, Chrysler's Engineering genius said at a recent banquet in Detroit applies equally well to every Tool Engineer. It epitomizes our position today: "We are now, all soldiers in the service of our Country and our God. We know how to do what Uncle Sam wants us to do and we will do it. We must get off our fannies and go to work."



# RIGHT or WRONG?



## ... TEST YOUR KNOWLEDGE OF "ACORN" DIES

HERE are 12 questions about "Acorn" Dies. Out of 7 tool foremen who recently tackled them, only one was able to score 100%. How about you? Don't peek at the answers in the lower right corner till you've checked your knowledge.

1. "Acorn" Dies can be used on all makes of hand or automatic screw machines, turret lathes, bolt cutters, drill presses, etc.  
☐ Right ☐ Wrong
2. "Acorn" Dies can only be used on fixed centers.  
☐ Right ☐ Wrong
3. "Acorn" Dies are adjustable.  
☐ Right ☐ Wrong
4. "Acorn" Dies do not require lead screws on machines on which they are used.  
☐ Right ☐ Wrong
5. "Acorn" Dies can be used on any machines which reverse either the die or rod when the desired thread length has been cut.  
☐ Right ☐ Wrong
6. There is only one size of "Acorn" Die blank for all thread sizes.  
☐ Right ☐ Wrong
7. There are standard holders which permit "Acorn" Dies to be used with "button," spring or floating die holders.  
☐ Right ☐ Wrong
8. Smaller than ordinary "Acorn" Dies can be used with a given holder.  
☐ Right ☐ Wrong
9. Each size of "Acorn" Die holder is available with only one size shank.  
☐ Right ☐ Wrong
10. Genuine "Acorn" Dies have an exclusive patented "heel" on the cutting lands that prevents tearing threads on reversal.  
☐ Right ☐ Wrong
11. "Acorn" Dies are so uniform in size that they can be removed for sharpening, or changed without checking machine set-up.  
☐ Right ☐ Wrong
12. A special fixture is needed to hold dies for sharpening.  
☐ Right ☐ Wrong

For years "Acorn" Dies have hung up amazing records on various types of production work. Consider them for any job where dies seem to wear out rapidly.

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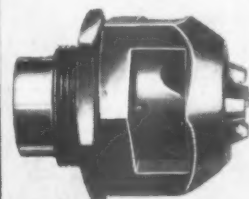
"Acorn" Dies are furnished in 5 different sized blanks.



Regular "Acorn" Die holders for screw machines that reverse die or rod automatically.



Releasing "Acorn" Die holder for hand screw machines.



"Acorn" Die Adapter, for button, spring or floating holders.

*This is one of a series of advertisements published by Greenfield Tap & Die Corporation to help users get greater production from their small tools in these critical times, through making useful facts more widely known*

**GREENFIELD**

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- |          |          |           |
|----------|----------|-----------|
| 1. Right | 5. Right | 9. Wrong  |
| 2. Wrong | 6. Wrong | 10. Right |
| 3. Right | 7. Right | 11. Right |
| 4. Right | 8. Right | 12. Wrong |

THE TOOL ENGINEER

"... the Tool Engineer is the chief press agent of aerial transportation. It is he who will make it possible for the average Mr. Citizen to afford this luxury."



Louis Biehler

## Multiple-Sheet Profiling and Forming by Rubber

By *Louis Biehler*

Asst. Supt., Aircraft Division, Pullman Standard Car Co.

**D**URING the past twenty years tooling for aircraft has shown remarkable progress. The airplane of two decades ago was built almost entirely by hand, with little thought for, or possibility of interchangeability. However, that was before Tool Engineering was applied to the industry.

In those days the aeronautical engineer was limited only by his own imagination. Today with the collaboration of the Tool Engineer, his ideas, while not being restricted, must combine if possible ease of manufacture, interchangeability and standardization, with aerodynamic requirements.

If this combination fails, then it becomes a Tool Engineer's problem because aerodynamic requirements must be held at all costs. It may be said, therefore, that being responsible for all manufacturing problems, and in view of his achievements insofar as reducing the cost of aircraft, the Tool Engineer is the chief press agent of aerial transportation. It is he who will make it possible for the average Mr. Citizen to afford this luxury.

It may well be remembered that there are two factors necessary in every success. Enterprise—that is to know what to do and how to do it. That is the reason why some men are tool designers and some engineers. Also that it is characteristic of the tool designers to take initiative in any project in creating new tools for industry, which is well expressed by this axiom. Every time one man puts a new idea across he finds ten men who thought of the idea before him, but they only thought of it.

Increased use of flat sheet stock material in Aircraft manufacture has made it necessary to devise improved means for manufacturing sheet metal blanks of irregular shapes from the rectangular sheet stock. This problem is accentuated by the present pressure for high speed production of military aircraft. It is a particularly



Onsrud two arm router cutting sheet metal blanks.

difficult problem due to the complex shapes and variety of pattern sizes required by aircraft design. The manufacturers of metal aircraft have developed equipment that is specifically designed to meet the requirements of the aircraft industry. Considerations met have included minimum tooling outlay, maximum flexibility of equipment, and low cost, rapid, accurate duplication of parts. Combination drilling and profiling equipment permits production of finished blanks, including multiple drilling operations,

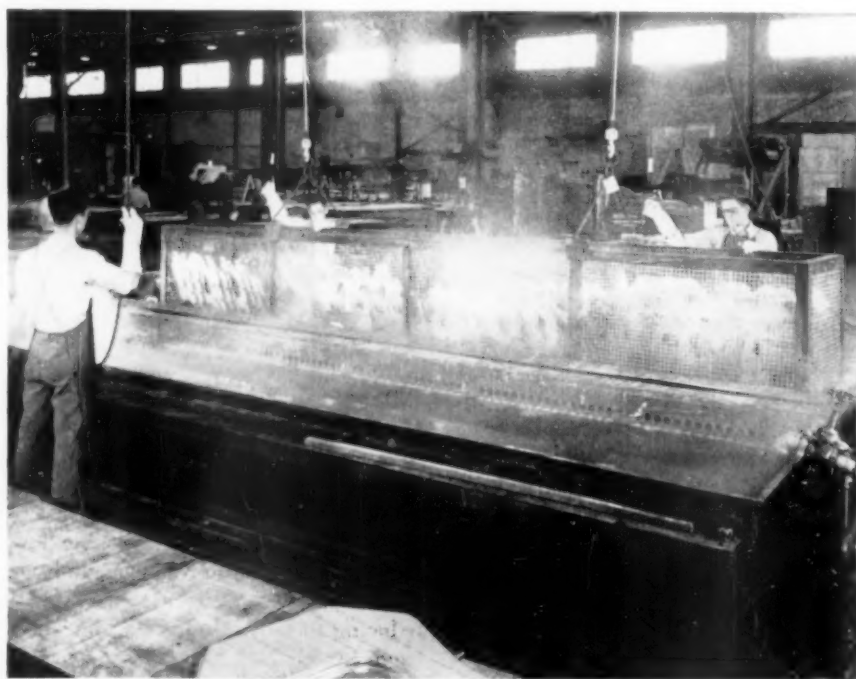
for support of the Router, or the Drill Head. We have designed these machines to our own specifications, and built them in our own shops, but with the active cooperation of various tool and equipment manufacturers. The construction is quite rigid throughout, to permit steady movement of the Router and to eliminate any tendency to chatter when engaged against the work. The joint on the swinging arm permits the tool to reach any point on a 4' x 12' table. Complete freedom of motion at the

tables may be moved about at will on suitable casters, and locked in working position by quick-acting "Jacks" of conventional type. The top of each table is built up of heavy plywood to provide for attachment of the stock by means of lag screws.

### Drilling Equipment

The drilling equipment consists of an electric high frequency motor of about 1 H.P. operating at 14,600 RPM, which is mounted at the end of the pivoted arm. An air operated drill spindle carries a hardened steel drill bushing with cone-shaped head for accurate location of the drill, and also maintains pressure against the stack of sheet material. This improves accuracy of the drilling operation and prevents drill chips from creeping in between sheets.

The Router Head is driven by a high frequency 5 H.P. electric motor at a speed of 14,600 RPM. The Router motor is mounted on vertical ways at the end of the pivoted arm, and may be raised and lowered for feeding the cutter into and clearing it from the work. This provides the operator with a degree of control over the tool head which permits extreme flexibility of operation for both internal and external profiling of complex shapes. Although most of the material handled is Dural or Alclad Alloy, it is also possible to rout such sheet material as Linoleum, Copper, Brass, Plexiglas, Micarta, Masonite, etc.



Parts being washed after routing.

with only one handling of material. This not only reduces handling time, but minimizes scratching or marring of the alloy sheets themselves.

Basis of the profiling method is to stack a number of standard size sheets of stock material on a table and to cut them all at once to the outline of a single pattern, using a Router Head as the cutting tool. The process is sufficiently flexible to permit either the profiling of a single sheet or a stack of sheets comprising as much as  $\frac{3}{8}$ " to  $\frac{1}{2}$ " total thickness. It is possible to handle as many as fifteen sheets in one operation and to stack the work and arrange the small patterns on a large layout so that an average of only about nine per cent of the original stock is lost as waste.

The Drilling and Routing unit consists of a heavy central pedestal on which are pivoted two jointed arms

inner pivot point is attained through use of large roller bearings, well protected from dirt and metal chips, and thoroughly lubricated. The arms can be moved by a touch of the finger.

The arm is equipped with cone adjustments on bearings at the pivot point and at the "knee", to take up any wear which may occur. Operation of these machines is always in pairs, that is, both arms on a pedestal are drilling arms or routing arms. This prevents chips from the routing tool from interfering with the operation of the drill, whereas the router operators, being accustomed to a heavy volume of chips, are not disturbed by them.

Special type portable tables, 48 inches wide by 144 inches long support the stacks of sheet material for drilling or profiling operations. This table is the same size as the standard aluminum alloy sheet stock. These

### Special Bits

The actual cutting and profiling operation is accomplished by the use of tools which are termed router bits. These bits are special, single lipped, spiral fluted end mills, of a similar design to the standard machine shop tools of this name. Due to the high speed at which they operate, they are provided with a much greater rake and clearance, and have a slightly concave face. These bits are available in various sizes, but best operation, both from the standpoint of parts' design and routing operation, is obtained by using a bit of approximately  $\frac{5}{16}$ " diameter. This size limits internal cutout radii to  $\frac{5}{32}$ ", which does not interfere to any extent with design. A cutter of this size has sufficient strength and rigidity to withstand hard usage and fast cutting. The quantity of work possible with



these cutters depends to a large extent upon their being kept sharp. As soon as the keen edge has worn off, the speed and the smoothness of the cutting decreases, which has a tendency to overload the Router motor, and frequently results in hanging up and breaking of the bit. Our practice indicates that a router bit may be used for routing of Alclad for approximately two hours time per grinding. Grinding of cutter consists only of removing sufficient stock in the flute and not the periphery to renew the keen cutting edge. Cutters may be reground repeatedly, until the land has been completely removed, after which they must be discarded. Minor changes in diameter of the cutter are compensated for by graduated guide collars on the shank of the Router chuck.

#### Use Guide Blocks

The routing is accomplished by the use of individual guide blocks, against which the above-mentioned guide collar bears during the cutting operation. These blocks are referred to as Router Blocks, and are usually made of sheet Masonite or steel of about  $\frac{1}{2}$ " thickness. Individual flat layout templates serve as patterns for making of these blocks. Most such blocks are cut on a wood shop router directly from these templates. Suitable allowance is provided in making the Router blocks for the difference in diameter between the Router bit and the guide collar on the Router chuck. This allowance necessitates under-cutting of the block by this fixed amount. Router blocks which involve aggregate cut-outs or narrow sections are sometimes provided with a reinforcing plate of Duralumin to prevent distortion due to pressure of the guide collar during the cutting operation.

The pre-drilling of the stacked sheet stock preparatory to routing is done by use of a master drill template. These templates are made the same size as the stock sheets which are to be drilled. Flat layout templates for the individual parts to be produced are grouped on a sheet of  $\frac{1}{4}$ " plywood, so as to nest together with approximately  $\frac{1}{2}$ " of space between each template. Enough such templates are used to effectively cover the entire surface of the sheet to be drilled, and after the arrangement has been completed, these individual templates are riveted in place on the plywood. The individual templates carry

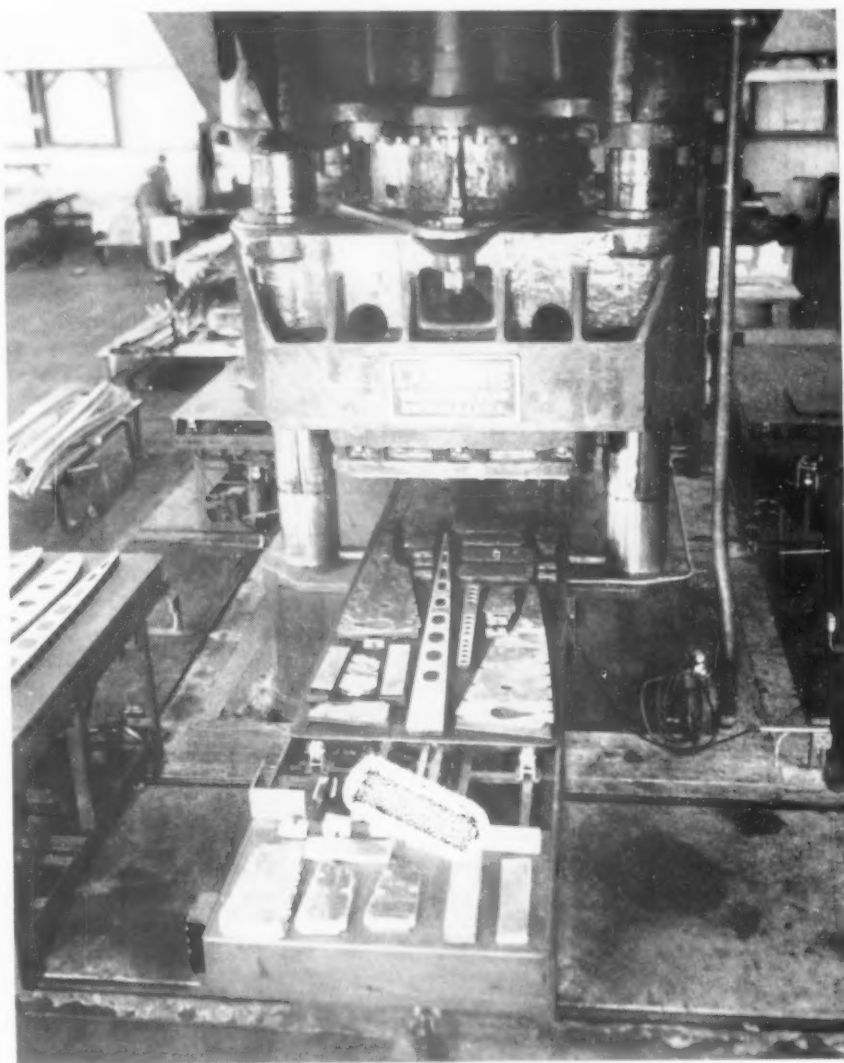
all the hole layout required by the design of the part and at least two  $\frac{3}{16}$ " diameter indexing holes for use in securing the Router blocks during the subsequent routing operation.

In general, the work cycle for the production of drilled blanks is accomplished in the following manner: The desired number of stock sized sheets of metal are stacked on the Router table and the master drill template is placed upon the stack. This assembly is clamped firmly in position on the table, which is then moved to the drilling station. The operator of the drill goes over the entire surface of the template drilling all holes shown on the template, as called out by means of a suitable drill size code. When the drilling is complete, the table is moved away from the drill station to make way for the next table.

The clamps are released and the

master drill templates removed from the stack. Individual router blocks for each part to be cut are placed in the proper position and are fastened down by means of suitable  $\frac{3}{16}$ " lag screws which pass through the above-mentioned indexed holes and engage the wood surface of the Router table. An electric motor driven wrench is used to insert and remove these lag screws.

When all blocks are in place, the table is moved to the routing station and locked in position. The routing operator proceeds to cut the blanks by passing the router around the periphery and the internal cutouts of each block, making sure that the guide collar maintains a constant bearing against the edge of the block. When all cutting has been done, the table is unlocked and removed from the routing station to make way for the



2500 ton Hydraulic Press used in Rubber Forming Operations

next table and moved to the unloading station. Here the lag screws are removed, the blocks taken off and the completed blanks are washed, burred and stacked in racks for the next fabricating operation. The metal which remains on the table consists principally of narrow strips of scrap which may be discarded.

The blanks produced by the above outlined method are characterized by clean smooth edges. Both drilling and routing operations can be done rapidly and accurately by an experienced operator, with tolerances approaching those obtainable by use of dies. A further advantage, from the standpoint of the aircraft manufacturer, is the practical absence of rough edges which sometimes cause fracture of the metal during subsequent forming operations. Although the routed edges are for the most part free from burrs, it is sometimes necessary to perform a burring operation on the top and bottom blanks in a stack, since the edge is not adequately supported during the cutting step.

### Washing Machine

For this burring work, a machine has been developed, which washes off all foreign matter from the blank, and presses the burrs down to a smooth edge between polished steel rolls. This unit also removes excess water and discharges the blanks ready for subsequent forming operations. Development of this machine has practically eliminated former slow hand-burring work.

A typical table layout, as described above, may involve the drilling and cutting of as many as thirty or forty different blanks, and the drilling of as many as 3500 holes. Such a setup may be run through the drilling and routing cycle in a little over an hour. A number of tables are used, so that loading, drilling, routing and unloading stations may be kept continuously working. It is thus possible to produce blanks for small lot production at a very low unit labor cost, which in some respects shows decided advantages over punch press fabrication methods.

There are many variations of the above described process which may be applied to aircraft work. The drilling and trimming of large flat skin sheets, the slotting of tubing and the milling of irregular outlines and cut-outs in extruded metal sections, are

typical of the work which can be done with this equipment. It has also been found advantageous to use an adaptation of the wood shop pin type router for the cutting of small flat blanks which cannot be satisfactorily secured to the router tables, and for the trimming of form parts. For such uses it is necessary to provide special router blocks or jigs which secure the part in a nest so as to present the desired face or edge to the router bit.

The above discussion sets forth only in a general way the variety of work which may be performed on these drilling and profiling machines. Their development has undoubtedly been a valuable contribution to the equipment and methods required for the successful manufacture of metal aircraft.

### Use of Plastic Rubber

The use of plastic rubber in connection with power press and form blocks for the forming of sheet metal dates from early in the '30's. The idea originated, as many present day processes do, from old ideas modernized. My original setup was made in the only available press unit which was adaptable to sufficiently large surface areas, namely a 125-ton capacity power brake. The flat platen, having a surface area of 12" x 36", was set on the bolster and a suitable receptacle was provided on the moving ram to hold a pad of rubber of approximately this size. This receptacle had a skirt which conformed to the rectangular face of the platen so as to provide for effectively confining the rubber during the forming stroke of the press.

### Using Unrestricted Rubber Pads

Early experimental work with this setup showed that due to the fixed depth of the press stroke and the incompressibility of the rubber that it was practically impossible to completely confine it. As a consequence, after a few tests the platen was cut down to provide a face 10" x 34" and allow for 1" clearance all around so that the rubber could flow out and down around the platen or bolster at the bottom of the press stroke. This setup was used for a time to perform extensive tests on this method of forming and to do considerable actual forming of parts for the first all metal models.

These tests not only served to prove

this method of forming, but also to establish the type of rubber to be used in accomplishing the desired results.

### Shore Hardness of Pads

Three different rubber pads were made for this setup. The first had a Shore hardness of 45 to 50 which proved to be too soft and spongy to give desired forming characteristics. The second pad had a Shore hardness of 75 to 80 and was found to be much too hard, since it overtaxes the capacity of the press to obtain the desired plastic condition of the rubber. The third pad, having a Shore hardness of 65 to 70, proved to give the desirable plastic flow characteristics, while at the same time it had the ability to withstand the hard usage to which it was subjected. Material of essentially the same composition and hardness is in use today in the larger and more powerful hydraulic presses.

Data was also obtained from the original power brake setup upon which to base the design of the 2500-ton hydraulic presses which are now in use. Pressures obtained on the power brake setup with the 1" clearance all around were in the neighborhood of 725 pounds per square inch platen area. This neglects possible loss of pressure due to flowing out of the rubber during the forming stroke. The press was designed to provide a pressure of approximately 825 pounds per square inch on a platen area having 5580 square inches of surface. Since the hydraulic press gave considerable leeway in length of the stroke so that working pressure could be accurately governed during operation, it was no longer necessary to leave the 1" clearance around the platen. Therefore, the skirt on the pad holder was made to provide only about 1/16" clearance when it engaged the platen. This accomplished an effectual confinement of the rubber and assured equalized pressure over the entire surface of the platen.

### Greater Unit Pressure Tried

This same essential design was incorporated in the new 4500-ton hydraulic press which was placed in operation late in 1939. However, by that time the advantage of greater available unit pressure had been definitely established, and as a consequence the press was designed to provide a maximum of about 1450

pounds per square inch. It has been found in practice that on soft materials such as Alclad, 1200 pounds represents a practical pressure. At greater unit pressures there is a definite tendency to emboss or coin any imperfections in surface of the form block into the surface of the metal being formed. Another disadvantage of higher pressures was that on external beads and other special forms frequently used on form blocks, the presence of any sharp internal corner

3 or 4 men, where by hand forming it had formerly required as much as 8 hours to form a single part. With continuing improved methods of handling and stacking the rubber and the development of a molded block or pad of rubber, it is possible that production of such parts can be more than tripled with the same equipment.

This rubber stacking method of forming necessarily eliminates the possibility of complete confinement of the rubber within the forming space.



Parts ready to be formed by rubber.

showed a decided tendency for shearing or fracture of the sheet metal during the forming operation.

#### Deep Drawing with Stacked Pads

Another somewhat different application of rubber for forming was demonstrated in 1934 and has been used with increasing frequency since that time as a means of cutting down labor in the forming of complicated large metal shapes such as nacelle tail cones and wing tip skins. This is called stacked rubber forming. This method of forming is accomplished on blocks which provide for a deep draw or stretch of the metal by the stacking of individual sheets of forming rubber in such a way as to accomplish the desired pulling in of a flat sheet of material so that it assumes the form of the block. Even by hand handling and stacking of these rubber sheets it was found possible to form 60 to 120 such parts in an 8-hour shift of

What actually happens is that the forming rubber is squeezed out of the die, and the actual forming pressure amounts only to that built up by the tension on the outer edges of the rubber sheets. Nevertheless, accurate and interchangeable parts are commonly produced by this method. It is anticipated that by use of suitable dams and traps on these blocks it will soon be possible to form beads and other special forms by this method.

#### Transition from Wood to Steel Blocks

The first blocks used in rubber forming were made of wood. Maple and other hardwoods were used during the experimental work, but it was soon discovered that wood is incapable of withstanding the pressures which had been developed in order to accomplish the forming. Therefore, within a few months after first trying out the rubber forming process, ex-

perimental form blocks were produced by casting zinc into slabs and working these slabs into form blocks. These blocks were much superior to wood but had a relatively short life expectancy because of the softness of the metal and its tendency to crystallize and break. Some negotiations were taken up with metal manufacturers with the result that in 1936 we were able to obtain rolled zinc sheets in desirable thicknesses. These rolled sheets were much harder than the cast material, and as a consequence blocks made from rolled sheet were used quite extensively and are still in use to some extent. Rolled zinc also machines as readily as hard wood, utilizing the same equipment.

Steel was also used for form blocks. However, with available methods of fabrication these blocks were quite expensive and were not used to any great extent until the Fall of 1939 when, as a result of larger production quantities and improved methods of fabrication, it was found that steel blocks could be made economically enough to be used more freely for hydro press forming.

#### Super Masonite Blocks Used

Masonite, a pressed wood fibre material, was first used for form blocks in 1937. This material was much harder than wood and was found at that time to be fairly suitable for blocks so long as no hand forming need be done subsequent to the rubber forming. However, due to inadequate pressures obtainable on the available press equipment, most parts required some hand forming, and as a consequence Masonite was used only for temporary or experimental blocks up until late 1939 when presses of greater tonnage were placed in operation. At the present time, due principally to the higher pressures obtainable, Super Masonite is used predominantly for making of production form blocks, limited, of course, to parts which do not require severe hand forming.

#### Kirksite Metal Blocks

Soon after the advent of Kirksite metal (an alloy of zinc, aluminum and copper) which was intended primarily for drop hammer dies, the limited use of this material on deep cast hydro press blocks was initiated. These blocks were so satisfactory that the casting of zinc blocks has practically been discontinued.

At the present time form blocks for rubber forming are limited to Mason-



ite, zinc, Kirksite or steel, depending upon the service required.

Masonite 50 lb. per cubic foot

Zinc 436.5 in. per cubic foot

Sawing—no comparison

Filing—four times as fast as zinc

Grinding—16 times as fast as zinc

Fly cutting—4 times as fast as zinc.

For this comparison one block made of Masonite cost \$25.00 for material and labor. The other made of zinc cost \$66.00 for material and labor.

This forming, of course, could also be done by more expensive tooling, such as the conventional forming dies that are used by the automotive and other high productive industries. Aircraft production is still very small and, therefore, this type of tooling would be prohibitive.

### Experience with Alclad

As based on our actual shop experience to date, 24SO Alclad is the most ideal material for production with a rubber die. It is adaptable to complete forming of flanged parts having both inside and outside radii flanges, as well as compound curves. With proper blocks it is possible to achieve flange formation involving as much as 135° bends. Complete forming of internal and external beads, compound flanged lightening holes, face and flanged joggles and drawing of indentations of appreciable depth is possible with this material up to a thickness of .040, and in some cases .051. Formation of flanges and partial forming of joggles and beads can be accomplished on gauge thicknesses up to .081 requiring a minimum of subsequent hand forming to set the joggles and the beads. Flanges may be formed on stock as thick as 0.128. Naturally, the greater the thickness of the stock, the more difficult it becomes to stretch or shrink the metal in forming flanges. The practical limit for radius flanges is about .081. This material requires about 3° springback allowance in the forming of a 90° bend.

Number 24ST Alclad, that is the 24S alloy in the hardened state, also has favorable rubber die forming characteristics. This material may be used quite satisfactorily where forming of flanges, internal and external beads and slight draws are required up to approximately .051. Radius flanges having an inside radius may be formed with rubber up to .040 with

comparative ease. Outside radius flanges have a bad tendency to wrinkle, and always require some subsequent hand forming. Straight line bends can be made up to .064 thickness, assuming a 90° bend. Springback allowance of about 9° is necessary. It is impossible, even in light gauges, to completely set joggles and beads in this hardened material with rubber forming.

24SRT Alclad, which is the work hardened tempered state of the 24S alloy, is considered for all practical purposes as unsuitable for rubber die forming. It may not be either stretched or shrunk and requires such a great allowance for springback (18° on a 90° bend) that it is difficult to build satisfactory forming blocks for its use. Where required, it is possible

**"As based on our actual shop experience to date, 24SO Alclad is the most ideal material for production with a rubber die. It is adaptable to complete forming of flanged parts..."**

to make straight 90° flanges in this material up to a thickness of .064.

The softer aluminum alloys, 3S0, 3S½H, and 52S0 have similar forming characteristics to 24SO Alclad. However, this material apparently lacks the tensile strength requirements which are necessary for satisfactory drawing with rubber and is more suitable for forming of complicated parts, either by spinning or by use of metal dies in a drop hammer or punch press.

### Forming Rustless Steel

Inconel and dead soft 302A stainless steel show limited satisfactory forming characteristics in lighter gauges, that is up to about .035. These metals are fairly ductile and will stretch in the forming of inside radius flanges and internal and external beads of limited depth. Outside radius flanges which require some shrinkage require considerable hand forming to remove wrinkles, and repeated reforming under the rubber to achieve even a 90° bend. Jogging must, for the most part, be done by hand.

High tensile alloy steel such as X4130 can be formed on straight bends, and simple forms by rubber pressure. However, in order to obtain satisfactory uniformity of parts, it

has been found best practice to use metal punch press dies for the forming of metals of this sort.

### Varying Pressures Per Inch

From repeated tests which have been made since installation of the larger hydro presses it seems obvious that the magnitude of the pressure per unit area is by far the most important factor in this type of forming. The 5000-ton press has sufficient capacity to make it possible to apply much greater pressure per unit area than was possible before. It was found that by increasing this pressure from the 800-pound per square inch maximum on the old hydro press to from 1000- to 1200-pound per square inch, that it was possible to completely form parts which had required a great deal of subsequent hand work after forming at the lower pressure. The use of these higher pressures also established the fact that parts which, it was felt, could only be formed from 24SO Alclad, could now be formed satisfactorily out of tempered material, 24ST, thus eliminating the heat treat operation. The development of the use of higher pressures for rubber die forming has not, as yet, established any definite maximum at which the advantage of greater pressure ceases. Experimental work is still in progress toward that end.

### Hot Forming

The rubber die forming of magnesium is still in the stage of experimental development. The fact that this material must be heated and kept hot during the forming operation introduces difficulties not only in temperature control, but in finding a suitable compounded rubber which will withstand the temperature required for any appreciable period of time. Form blocks must necessarily be made of metal, preferably of steel, and they must rest on a platen which is heated by electricity or some other suitable means, and controlled to maintain the temperature at a fairly constant level, in the neighborhood of 600°F. Test runs made so far indicate that this metal may be formed very easily with comparatively low unit pressures, and that in many cases no allowance is necessary for springback. Formed parts seem to have good stress characteristics and the present indication is that this material may possibly be found an important material for fabrication of formed structural aircraft parts.

# Molybdenum High Speed Steels

By Leonard C. Grimshaw

Metallurgist, Latrobe Electric Steel Company



Metallurgist Leonard Grimshaw

**B**ECAUSE there exists a definite shortage of tungsten, and because our domestic production and imports are now, and will be, insufficient for all defense and civil needs, our Government has ordered that no customer of a producer of high speed steel shall place an order with that producer for Class B high speed steel, if Class A high speed steel could reasonably fulfill his requirements. As you know, the ruling under which we are told that we must conserve tungsten, is general preference order M-14, issued by the Division of Priorities of the Office of Production Management, on June 11th of this year. It requires each user to purchase as much of the

molybdenum type (Class A) as of the tungsten type (Class B) high speed steel, and defines the molybdenum type as containing over 3% molybdenum, but not over 7% tungsten. The tungsten type contains over 12% tungsten.

I want to show you how you can use the molybdenum high speed steels, and not disturb your manufacturing output.

Men have always been ingenious, and when they have been faced with a shortage, or lack, of any commercial product, they have put all their skill to work in finding another that will do the work just as efficiently, and at no increase of cost. During World War I, as you know, we faced a serious shortage in tungsten high speed steel. What happened? Metallurgists went to work, chemists went to work, and the result—a product that does every bit of the work expected of tungsten. You are likely to think that a substitute is never so good as the original. If this were true we would not be using automobiles, but still would be using a horse and carriage. Every science must advance, or die. If our metallurgists had said "We must have tungsten, and nothing else", the steel business would have died, or at least it would have stepped back decades.

## Substitutes Often Better

The use of molybdenum as a sub-

stitute for tungsten in high speed steels, is an old idea. Taylor & White, of 18-4-1 fame, stated that molybdenum could be used in place of tungsten. The United States Army, and at least one steel company, were experimenting with molybdenum steels during the tungsten shortage of World War I. In 1930, Captain S. B. Ritchie of Watertown Arsenal, described some of the basic steels used today. (July 1930, *Army Ordnance*, Vol. XI, No. 61). At the Buffalo Convention of the American Society for Steel Treating in October 1932, Mr. J. V. Emmons read a remarkable paper that gave a general description of many types of steel in use today, and reported the results of his tests on twist drills, which even then showed the new steel to be superior to tungsten high speed steel for that purpose.

Why, then, has there been any hesitancy at all in using molybdenum instead of tungsten? We are going to be strictly honest, and say that molybdenum decarburizes more readily than 18-4-1, and is more susceptible to grain growth. If we could not overcome this it would be a serious drawback, but the metallurgists found a simple treatment, inexpensive to use, and taking only a little time, so that this one drawback is negligible, and need not be considered when using the steel. And so, from 1934 onward, the industrial use of molybdenum high

speed steel has shown a steady and rapid increase. Before the present tungsten regulations, one fifth of all high speed steel used was molybdenum type. As soon as the merits of this steel were established, our company, in September 1934, began melting commercial sized heats to replace the 18-4-1. Since that time, the product has proved its ability to compete with the tungsten steel.

### Comparison of Analyses

Let us see what these steels contain. Basic tungsten high speed steel has:

C	W	Cr	V
.70—.76	18.00	4.00	1.00

**Basic Tungsten High Speed Steel**

Now the molybdenum steels contain about one part molybdenum for each two parts of tungsten displaced. Remember, the carbon content is selected for specific tool requirements, in the same manner that it has always been selected in the past for tungsten high speed steel. Speaking generally, molybdenum type requires about .08 to .10 percent higher carbon than the tungsten types, because they take the additional amount of carbon into solution when hardening. So the change from 18-4-1 became:

C	W	Cr	V	Mo
.72—.82	1.30—2.00	3.75—4.25	.90—1.30	7.75—8.75

**No. 1 High Speed Steel  
Tungsten Molybdenum Type**

This steel has been in commercial use for some years, and has proved its merits for such uses as twist drills, and many other cutting tool applications. The next step was to eliminate the tungsten altogether, and put in 2% vanadium, at the same time raising the carbon content, in exactly the same way we increase the carbon when going from 18-4-1 to 18-4-2.

C	W	Cr	V	Mo
.85—.92	—	3.75—4.25	1.60—2.00	7.50—8.50

**No. 2 High Speed Steel  
No Tungsten-Increased Vanadium**

This produced a really fine steel. It answers practically every requirement for cutting tools, and makes an especially fine twist drill.

When extra red hardness was needed in tungsten steels, cobalt was added in amounts up to 12%. These cobalt steels are used for deep cuts, chilled cast iron, and manganese steel.

C	W	Cr	V	Mo	Co
.76—.84	1.50—2.00	3.75—4.25	1.15—1.35	8.00—9.00	4.50—5.50

**No. 3 High Speed Steel  
Low Cobalt-Tungsten Alloy**

The molybdenum cobalt steels do not decarburize any more readily than the tungsten cobalt high speed steels, and are their equal in every way. Look for a minute at the analyses of these steels.

C	W	Cr	V	Mo	Co
.76—.84	1.50—2.00	3.75—4.25	1.15—1.35	8.00—9.00	7.00—8.00

**No. 4 High Speed Steel  
High Cobalt-Tungsten Alloy**

A great deal of work has been done in developing and improving a steel to be used for general purpose work. In doing this work, we were always searching for a steel that with very few exceptions could be used for any type of machining operation, because you know that 18-4-1 could be used in 90% of the work. We wanted one that could be used in 98% of the work, and we believe that we have found it! This steel is part tungsten, part molybdenum, call it No. 5.

C	W	Cr	V	Mo
.82—.90	5.00—6.00	3.75—4.25	1.40—1.70	3.50—5.50

**No. 5 High Speed Steel  
Tungsten-Molybdenum Alloy**

This steel is a good steel, vastly superior to 18-4-1 for nearly all cutting purposes, and it has an advantage over straight molybdenum steel because it does not have any great tendency to decarburize. Tests have shown that this steel is not only superior to 18-4-1, but in a great many operations it is superior to 18-4-2, and 18-4-3, and the tungsten cobalt steels.

### A Steel You Can Get

The greatest advantage, perhaps, at this time, is the fact that you can purchase this steel in quantities actually

required, and still keep within the restrictions placed upon us by the Government.

If, for some purposes, a more abrasive resistant steel is desired, the carbon may be raised, and three percent of vanadium added. This is the analysis of steel No. 6.

C	W	Cr	V	Mo
1.10—1.20	5.50—6.00	3.75—4.25	2.80—3.20	5.00—5.50

**No. 6 Abrasive Resistant Steel  
High Tungsten Molybdenum Alloy**

Let us compare the heat treatment of the various steels. In all molybdenum steels decarburization does not take place at temperatures below 1400°F., and only very slowly up to about 1550°F. In all steels, decarburization is a function of time and temperature, and increases with both.

A characteristic of molybdenum steel is that when it cools from 1900°F. or thereabouts, a blue smoke is given off from the scaled surface of the steel, as it cools through the 1750° to 1550° range. Because the smoke is seen only in high molybdenum steels, it is said to be molybdenum volatilizing out of the steel, but this is not really true. It is the molybdenum oxide — the scale — that causes the smoke. By chemical analysis, the loss of the molybdenum from the surface of the steel has been proved to be very small, but there is naturally a loss of carbon from the steel itself. This decarburization must be prevented. How can this be done?

### Prevention of Decarburization

Well, we can use atmospherically controlled furnaces, or salt bath furnaces, or else we can coat the tools with borax, or with one of the commercially prepared coatings that are made especially for use on molybdenum steels.

### Salt Bath Keeps Tools Clean

For those of you who can afford this investment, the salt bath or atmospherically controlled furnace will solve all your problems, and is one of the examples of the ease that can be purchased when money is no object.

Salt bath furnaces are usually complete in themselves, consisting of the preheat, high heat, and quench baths. They furnish full protection against decarburization in any kind of high speed steel. Quenching is done in the



salt quenching bath at about 1100° F., and this quenching bath removes the high temperature salt from the tools, so that there is no cleaning problem at all.

Besides salt bath furnaces, we can use any full muffle type furnace that has a controlled atmosphere. These may be heated by gas or electricity. The atmospheres are created by coke gas, by propane, by natural gas, or by manufactured gas. In general, the CO content should be about 2% higher for molybdenum steels than for 18-4-1. The atmospheres vary considerably, but one that would be typical consists of 10% CO and 3% CO<sub>2</sub>.

There are several furnaces on the market that generate their own atmospheres. The CO content usually runs about 34%, with only a trace of CO<sub>2</sub>. Such furnaces will harden high speed steels with no soft skin.

### Borax Coated Tools

For those of you who must consider the initial expense, and are already in possession of an ordinary muffle type furnace, satisfactory for hardening 18-4-1, but yet without a proper atmosphere, then decarburization may be prevented by a suitable coating on the tools. First let me stress the point that before using any of these coatings, the steel must be clean, and entirely free from oil and grease.

One frequently used coating is made by dipping the tools in a saturated solution of borax in water. When making this solution, keep the liquid at 150° to 200° F., and allow it to stand for at least 24 hours, so that it may become a true saturated solution. The small tools may be dipped in the solution and allowed to stand long enough to warm up, and when removed, the borax dries in a thin, powdery film. Naturally, large tools will first have to be warmed to a few hundred degrees, and then dipped. These, however, may be removed promptly, because they will dry from their own heat. Each tool will then be covered with a thin film of borax, which, if handled with moderate care, will not rub off. Then the tool is placed in the preheat furnace at 1450° to 1500° F., and the borax will melt to a thin, scarcely perceptible film. You can, of course, if you desire, sprinkle powdered borax directly on tools when heated to 1200-1400° F., but in using this method, care must be taken to use only the proper

amount of borax, otherwise the excess will pop off, or after heating drip off, and so contaminate the furnace bottom. In using these borax solutions, you will find that the hardened tools are coated with a thin layer which must be taken off with a wire brush, or sand blast, or a 10% solution of acetic acid. So if you wish to avoid this, use boric acid flakes in the solution.

There are at least three commercial coatings, or paints, that have been especially developed for preventing decarburization in molybdenum high speed steels, and they give good protection. They do not fuse, or run, at the temperatures used, and therefore do not affect the furnace hearth. They may be applied to the tools by brush, by spray, or by dipping. Allow the tools to dry, and then place them in the preheat at 1450° to 1500° F.

Sodium silicate, or water glass, may be thinned slightly and used satisfactorily for a protective coating, but is messy and more difficult to handle, and is therefore seldom used.

### Heat Treating Moly Steels

Suppose we discuss the hardening and drawing of each main type of molybdenum steel. Now hardening is done at about 2220° F. for all 8 to 9% molybdenum steels, whether they have cobalt added or not, and at about 2250° F. for steels Nos. 5 and 6. Notice, the temperatures are definitely lower than those used for the tungsten steels, and naturally there is an appreciable saving of heat in the long run. In fact, we have found that the life of heating elements in electric furnaces is increased about 50% by lowering the temperature 150° under that used for 18-4-1.

Of course, anyone who works in steel knows that tools should not remain in the hardening furnace one minute longer than it is necessary to keep them there, nor should the temperature ever be raised drastically. Either of these two things will cause grain growth, which naturally means brittleness in the steel. For instance, Steel No. 1, quenched from 2180° F. Rockwells C 64-65, and drops to C 64 when drawn at 1100° F; but if quenched from temperatures above 2240° F., it is still about C 64; but when drawn at 1100°, gets no softer, and will even take on considerable hardness. This is attributed to grain

growth, and the steels in this condition are brittle.

### Treatment of Cobalt Steels

Steels, 3, 4, and 5 are less susceptible to grain growth, or rapid structural changes. You may quench the steels in oil, salt bath, lead bath, or air, so that they may cool finally to 200°, in order that the proper transformation may take place. If the tempering is done in a lead bath, be careful to warm the large intricate tools to a few hundred degrees very slowly, so that you lessen the shock of placing the tools immediately into the hot lead. Of course, tempering is usually done between 1025° and 1075° F. This depends upon the hardening temperature used, and the final hardness you wish to obtain. Draw at 1025° F. if quenched from the low side of the hardening range, or at 1050° F. if quenched from the high side, if maximum hardness is desired.

For most general purposes a single draw is satisfactory, but if you desire greater toughness, with no loss of hardness, use a double draw, the same as you do with tungsten steels. In extreme cases, where exceptional toughness is required, more than two draws may be used. The first and second draws are done at 1050° F., and the following one, or two draws at 800° to 850° F.

When molybdenum and tungsten steels are hardened by their respective treatments, they are really very similar, and it takes a trained eye to distinguish any difference in the micro structure. With both steels, you can make a check on grain size and carbide solution with the microscope, but it is even simpler to judge by fracture and hardness tests.

### Hardening Temperatures

Let me give you the hardening temperatures to follow when hardening in atmospherically controlled or muffle type furnaces. Remember, however, if a salt bath is used, you should lower the temperature 20 to 30° F. Steels Nos. 1 and 2 are pre-heated at 1450° F. to 1500° F. Hardened from 2200° F. to 2240° F., quenched and drawn at 1025° to 1050° F. Hardness as quenched will be Rockwell C 64-65, and after the draw, C 65-66.

If it is more desirable that the steels have toughness, rather than hardness or cutting ability, raise the drawing

temperature. Raising the drawing temperature decreases the hardness of Steel No. 2 more rapidly than Steel No. 1. Although this indicates a difference in red hardness between the two steels, their practical performance appears to be the same. Remember, we are discussing Steel No. 2, which has extra vanadium and carbon to take care of the lack of tungsten. Performance is poor if the tungsten is left out, and not replaced.

Steel No. 3 is preheated at 1450° to 1500° F. and hardened from 2200° to 2240° F., quenched, and drawn at 1025° to 1075° F. Hardness as quenched will be Rockwell C 65, and after a 1050° F. draw, C 66. Steel No. 4 may be treated similarly, but you must raise the hardening temperature a little, to 2220° to 2260° F., because these two steels are nearly always required in the hardest possible condition.

Now we come to Steel No. 5, and here we find one great factor in its favor. It will not decarburize so easily as those containing little or no tungsten. In fact, this is so noticeable in this steel, that many manufacturers have found it unnecessary to use special atmospheres or coatings to prevent the formation of a soft skin. This is especially true in smaller sized tools, and as you can readily see, a tremendous time saver. Furthermore, with Steel No. 5, we find that temperature variations do not bring about such rapid structural changes as found in Steels Nos. 1 and 2. Because of the higher tungsten content, it is necessary to raise the hardening temperature a little—2240° to 2280° is the heat range. Draw at 1025° to 1075° F. to obtain a maximum hardness. The Rockwell hardness, as quenched, will be C 64-66, and after 1050° draw, C 65-67. For special purpose tools, such as cold heading dies, inserts, or trimming dies, a radically different heat treatment may be used. These tools may be hardened from as low as 1900° F. and drawn at 800° F. or higher.

In its hardening and decarburizing properties, Steel No. 6 is like Steel 5. It possesses excellent abrasive properties and because of this is difficult to grind. It is nearly always required at full hardness, and when quenched from 2250° F., and drawn at 1050° F., it is Rockwell C 66-67. When quenched from only 2200° F. and drawn at 1050° F. it is Rockwell C 64.

In making tools which require straightening, it is well to remember that molybdenum tools may be straightened while cooling from the hardening heat through the range 1000° to 300° F., exactly the same as tungsten tools.

### Forging Moly Steels

There is no difficulty in forging when molybdenum steel is used. On all except the type 5 steel, borax is used and should be sprinkled on in powdered form as soon as the steel is red, 1200° F. but not over 1400° F. Initial forging temperature on billet or bars (not ingot forging) should be 1950° F. to 2050° F., which will be found satisfactory for all grades, but the forging should be stopped when the steel has cooled to 1750° F., and reheated before work is resumed.

Have you noticed how steel with about 8% molybdenum and 2% vanadium retains, or even generates, more heat on fast forging? Because these high vanadium steels are also high carbon, watch the gain of heat carefully, so that the center of a large piece does not become overheated and burst.

We have given you the hardening, drawing and forging temperatures. Now let us tell you about annealing practices. Annealing is done at 1550° F., followed by slow cooling to 400° F. or lower. Because it must be cooled slowly, because the surface must be well protected, we strongly advocate annealing in a pot which contains dry sand, or mica, to which a small amount of carbonaceous material has been added. You could, for instance, add a few per cent of granulated charcoal, or lamp-black, or carburizing material. Or packing in cast iron chips will prove very satisfactory.

### Brazing and Welding

We have proved that molybdenum steels can be brazed, or welded, in the same manner as tungsten steels. After welding be sure to cool the tools slowly, and then anneal them, to bring about a homogenous structure at the welding zone. Brazing may be done when hardening, and the 1050° F. drawing temperature will relieve the strains.

Grinding may be done in the same way as for tungsten high speed steels, with the exception of Steel No. 6, which has been mentioned before. This high vanadium steel is difficult to grind because of its great resistance to abra-

sion. For this reason it is an excellent cutting steel, but in cases where the shape of the tool is complicated, and grinding becomes a problem, we recommend the use of Steel No. 5.

The molybdenum steels that contain no tungsten, or 1.75% tungsten, with no cobalt, can easily be distinguished from tungsten steels by the spark test. If for any reason your tungsten and molybdenum steels become mixed, it is a very simple matter to determine by the spark test which type of steel you are handling. Tungsten steels throw a dark red spark, with very little break-up of the spark streams, while the sparks off the two molybdenum steels Nos. 1 and 2 are much lighter in color, almost a light orange, with a break-up of the spark streams into spear points. While it may be difficult to separate steels Nos. 3, 4 and 5 from one another by spark testing, it is easy to differentiate these from tungsten steels, or from molybdenum steels Nos. 1 and 2, because the sparks have a tendency to flare, or explode, into star shaped particles.

### Conclusion

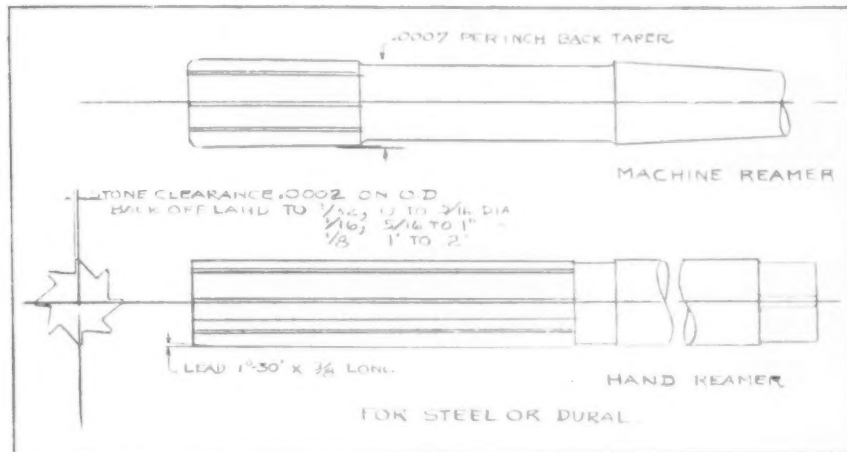
Perhaps you are wondering how you can use these steels. You are saying to yourself, "Will they make broaches, taps, reamers, or milling cutters?" We can tell you enthusiastically and confidently, "Yes, they will." Indeed it is our sincere hope that the facts we have given you about molybdenum steel, have removed from your minds any doubts you may have had concerning the methods of handling, or the performance you have every right to expect.

Many users of tungsten who have changed to molybdenum steels, have found such satisfactory results that they have discontinued tungsten entirely. We are really going to see a very interesting thing take place. Instead of the usual ten or fifteen years elapsing between the completed researches of the steel maker, and the final full acceptance by the public of a new steel, we are going to see these molybdenum high speed steels recognized, understood, and accepted, within a much shorter period of time. Remember, the steel maker has not had to rush his research through hurriedly because of the tungsten shortage—he had done it carefully and painstakingly before this emergency arrived. So we can only urge you strongly to try it, and we know that there will be no doubt about your results.

# Tool Engineering DATA SHEET

## SPEEDS AND FEEDS FOR DRILLING AND REAMING

By A. C. Siegel, General Foreman, Airplane Division, Curtiss-Wright Corp.



### SPEEDS AND FEEDS FOR DRILLING AND REAMING

Dia. of Drill	Feed Radial Drill	Dural	Lynite Etc.	Feed Radial Drill	Forging	Forging H.T. 150,000	Dia. of Reamer	Feed Radial Drill	Dural	Lynite Etc.	Feed Radial Drill	Forging	Forging H.T. 150,000
1/8"		3000	3000		1160	1062	1/8"		2850	2850		748	580
3/16"		3000	3000		1062	962	3/16"		2850	2850		580	531
1/4"		2850	2500		962	870	1/4"		2200	1925		531	481
5/16"		2500	2200		870	712	5/16"		1925	1760		481	371
3/8"		2200	1925		712	531	3/8"		1760	1500		374	356
7/16"		1925	1425		531	481	7/16"		1500	1160		356	290
1/2"		1425	1062		481	440	1/2"		1160	880		290	265
9/16"		1062	962		440	356	9/16"		880	748		265	178
5/8"	.012	962	800	.008	356	290	5/8"	.014	748	712	.010	178	135
3/4"	.012	800	618	.008	290	187	3/4"	.014	712	618	.010	135	75
7/8"	.010	618	500	.006	102	102	7/8"	.012	618	500	.008	75	40
1"	.010	618	500	.006	102	102	1"	.012	618	500	.008	40	40

Feeds not given are hand fed in multiple spindle drill.

The speeds and feeds in this chart are used as a guide in setting up work. They cannot be considered proper for every job, length of hole to be drilled or reamed, hardness of material, type of jig etc., may cause a variation either way.

**NOTE:** This is the fourth of a series of Data Sheets which will be published in THE TOOL ENGINEER hereafter. A handy three ring binder can be secured at any book, stationery, or dime store and will hold the sheets for convenient and frequent reference.



"If gages are used only in the inspection department, they can only pass or reject finished work and cannot serve as a preventative medium."



"STEVE" URBAN

## Importance of Gages

# In Interchangeable Manufacture

By *Stephen Urban*

Sales Engineer, Pratt & Whitney Div. Niles-Bement-Pond Co.

**I**N order to determine the accuracy and interchangeability of metal parts, gages are a necessity. We all can remember the increasing use of gages resulting from the first World War. That experience impressed upon American manufacturers the meaning of interchangeable manufacture and its economic value.

Several influences have contributed to the advancement in design and accuracy and broadened the scope of utility of gages. Among them are: Reduced manufacturing tolerance of product, functional requirements of mechanism, as well as the problem of producing at a lower cost.

One of the items which should be included in computing manufacturing cost is inspection. However, the functions and application of gages must be correctly understood. The fundamental purpose of gages is to prevent inaccurate parts from being produced. If a gage is to do that, it must be available at the place where work is produced and this means that the emphasis should be placed upon what are commonly called "working gages". If gages are used only in the inspection department, they only can pass or reject finished work and cannot serve as a preventative medium.

Certain necessary qualifications are

prime requirements of "working gages": 1st, they should be sturdy so that they can withstand reasonable wear; 2nd, they should be fast and simple in operation; 3rd, they should analyze the various dimensions being machined so that the operator will know the location and degree of the error; 4th, they should be positive in use without being affected by the hu-

man element; 5th, they should be adjustable to compensate for wear; 6th, they should be economical to recondition when worn. Working gages further should be capable of checking the product to a degree of accuracy well within the subsequent inspection made by inspection gages in order to eliminate possibility of conflict between working and inspection gages and to

*Trus-Form adjustable limit snap gage checking ground shaft accuracy right at the machine.*



prevent production of parts which will pass the working gages only to be subsequently rejected by the inspection gages.

The above explanation of the value of working gages does not mitigate the importance of the inspection department. The inspection department should check the gages used in production. This department interprets and enforces engineering specifications pertaining to accuracy of product. The gages used by the inspection department itself may differ from working gages in design or operation for the purpose of greater efficiency, but there should be no conflict in respect to either principle or results with the working gages.

One of the fundamental requirements for interchangeable manufacture is the availability of a basic standard of measurement. The Bureau of Standards maintains such a standard for linear measurement. Today, however, any industry doing precision work can own a set of master standards whereby the accuracy of gages used in the work shop could be verified. Precision gage blocks serve this purpose.

### Tolerance of Product and Gage

The foregoing has dealt mostly with the correct viewpoint of gaging. This is important. Some remarks regarding tolerance both of product and gages are pertinent. Obviously specifications for product tolerance should be as liberal as possible, commensurate with functional requirements of the assembled mechanism as well as manufacturing methods and price. Suitable Go and Not Go working and inspection gages should be provided for any dimension to be held within specified limits. There is a very good reason for checking a part to Not Go limits. It is erroneous to assume that because a part does not need to be held to extreme accuracy only a basic or Go gage is required. The main object in interchangeable manufacture should not be to demonstrate how closely a fixed size can be approached; the aim should be to construct as economically as possible a mechanism that will satisfactorily perform certain functions. With a Not Go gage as a guide the operator can thus make use of the full manufacturing tolerance, benefiting accordingly in machining time and tool life. Hence the

cost of limit inspection is quickly assimilated.

The accuracy of a part influences the type and cost of gages. It is a mistake to consider cost at the expense of accuracy of a gage. An example can readily prove this. Cylindrical plug gages are made to class X, Y, and Z tolerance. In the size range from .825" to 1.510" the class Y gage tolerance is .00009" and the class X gage tolerance is .00006". Given a product with a .0005" tolerance, when



Using a working roll thread snap gage to check accuracy.

using a double end cylindrical plug gage class Y (tolerance taken plus on the Go member and half plus and half minus on the Not Go member) there is a possible variation in size of the product within established limits of 73% of the tolerance, the other 27% being consumed by gage tolerance if the full permissible class Y tolerance for the gages exist. In other words, 27% of the work, while it is not measurable, might be perfectly acceptable. Using a class X tolerance gage, the comparative figures would be 82% variation in size of product within limits, and 18% gage tolerance. From the cost standpoint the class X gage would cost approximately 20% more than the class Y. Therefore, the question to decide is whether the additional 9% work tolerance available when using a class X gage offsets the 20% price increase on a small item

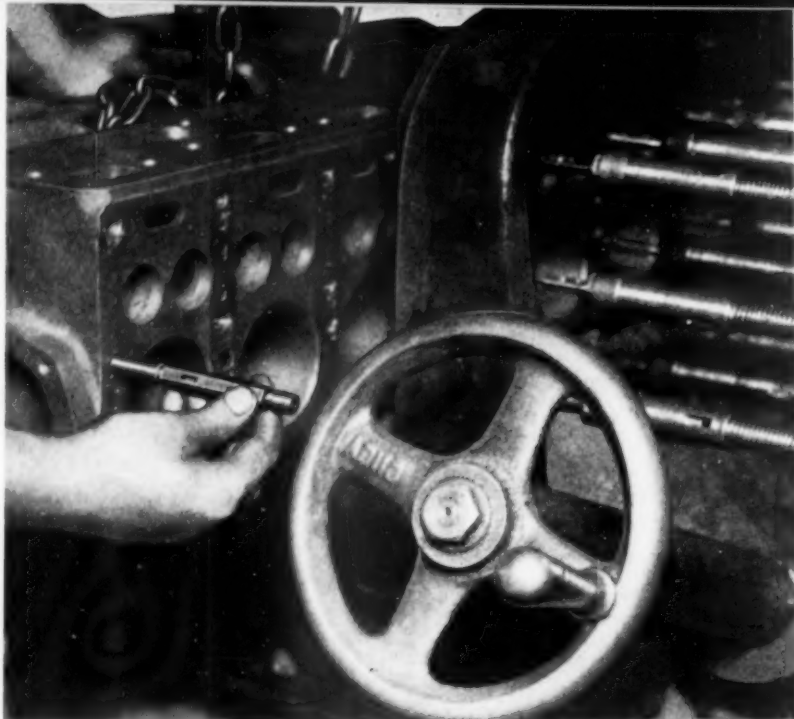
such as a gage when compared to the cost of the part, having in mind, of course, the full life of the gage and the quantity of parts produced. This is merely an example in regard to a simple plug gage, but such an analytical study when selecting either simple or complex gages would often provide a factual basis for the final decision.

### Thread Gages

When we come to thread gages, this question of gage tolerance vs. product tolerance likewise is important. When we insert a plain cylindrical plug gage in a hole, we are concerned with the effective size of that hole only. If it is out-of-round, the plug gage will go in only if the smallest diameter is as large or larger than the plug. In the case of an internal thread, the effective size must be as large or larger than the plug thread gage. The difference between the thread part and the plain hole condition is that the effective size of a thread is made of: Outside diameter, Pitch diameter, Thread form, Thread angle, and Lead. As these elements vary, we find the effective diameter varying and this point applies both to the gage and to the product. There is a tolerance on each of these elements in the gage and a greater tolerance on the product.

### Screw Thread Handbook

Something of what this involves can be cleared up by a further explanation. In the first place limits for screw threads have been standardized and are given in Screw Thread Handbook No. 25, published by the Federal Government. This book gives tolerances and clearances for American National form of thread. It also includes specifications for the form of thread plug and ring gages, and permissible gage-maker's tolerance. On a gage having 20 threads per inch, for example, the pitch diameter itself can vary as much as .0003". The lead can vary .0003" and if it is off the full .0003", it means that the effective size of that particular gage is increased .00052". (For a 60 degree thread 1.7321 is the constant by which to multiply the lead error to equal pitch diameter compensation). Angle error can also be translated into terms of effective diameter, the average angle tolerance on an X accuracy gage representing .0001" to



**"Go" and  
"Not Go"  
thread plug  
gage  
checking stud  
hole threads  
in an auto  
engine  
cylinder  
block**

.0002" in terms of effective diameter. The figures given in this example apply for class X accuracy thread gages. W accuracy thread gages recommended for class 4 and class 5 thread fits have less tolerance for every element of thread in line with the reduced tolerance permitted in the product. The purpose of these examples has been to show the wisdom of maintaining gage accuracy relative to product tolerance in order to get the full benefits of interchangeable manufacture.

Considerable progress has been made towards increased accuracy and refinements of conventional gages and in design of new gages. The selection of a gage in respect to type and accuracy should be governed by the requirements of the part in question. Human skill in reading closer than the potential accuracy of a gage is estimated measurement only and not controlled, and as a matter of fact is not necessary because of instruments available which measure to exact degree of accuracy required.

### **Degree of Accuracy**

The degree of accuracy required in certain products means that both the working and inspection gages must be capable of revealing variation in dimensions to tenths of thousands. This has necessitated the development of indicating type comparators. These indicating type comparators, which must be set to masters compare the product being checked with the masters and in many cases reveal the exact location and character of the error which often is desirable. They do not depend upon the sensitive feel of the user which is one of the limitations of

the so-called "feel" type of gages. An example of a feel type gage which merely controls interchangeability, but does not reveal the character and degree of error is a plain cylindrical plug gage. Sturdiness, accuracy, rapidity, ability to analyze, durability and adjustability are necessary features which indicating type comparators must possess.

### **Dependable Measurement**

For dependable measurement of precision parts and gages consideration must be given to details of temperature, pressure, and measuring contacts.

When taking precision measurements both the gage and the part being measured should be at the same temperature. If the gage is a comparator, the master to which it is set

should likewise be of the same temperature. The international standard temperature for measurement is 68 F and is the condition under which ultra-precision tools and gages are calibrated.

### **Measuring Pressures**

Standard measuring pressures have been adopted by the Bureau of Standards and the American Standards Association for the purpose of eliminating discrepancies in precision measuring due to the human element and variables in methods, etc. Some thought must be given to measuring pressure when gaging soft material on a part with a thin section.

Gages with different contacts viz. point, line, surface, may give different results particularly on soft material and on a surface not lapped. The reason is apparent.

Opportunities for the development of new and better gages are innumerable. Man's ability to measure has been the yardstick of his progress. Thirty years ago we considered a thousandth of an inch as the smallest part of an inch that it was practical to measure in any ordinary shop. Now we have basic standards accurate to millionths and instruments to verify the size of objects to millionths also. We speak confidently of tenths of thousands about parts produced in mass quantities. To this end both science and the practical man have contributed. And in all of this, gages have been the bridge between vision and reality.

• • • • •

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snap gage  
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accuracy of  
threads on  
long, special  
bolts**





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In this tooling plan the large flanged type tools remain mounted on the turret. This arrangement permits an infinite number of setups by simply (1) changing collets and bushings, (2) grinding cutters, (3) setting cutters, and (4) setting stops. Adjustable features on these bar tools quickly set cutters to new sizes. Only on extra long run jobs may it pay to change this tooling setup!

Check your turret lathes doing bar work against this recommended permanent setup. If you need additional Warner & Swasey Tools to adopt this time-saving setup, select sizes from your Warner & Swasey Tool Catalog.

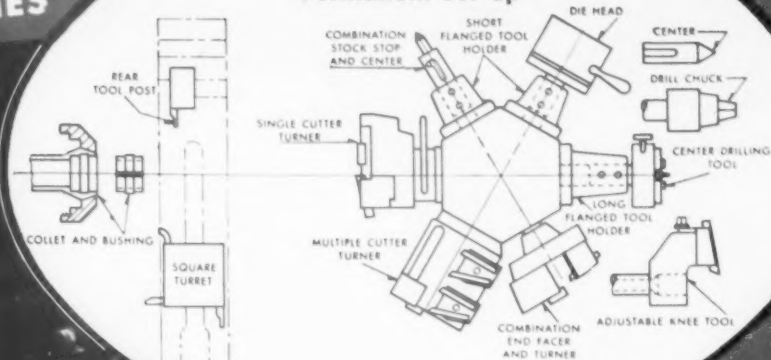
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LESS...WITH WARNER & SWASEY TOOLS

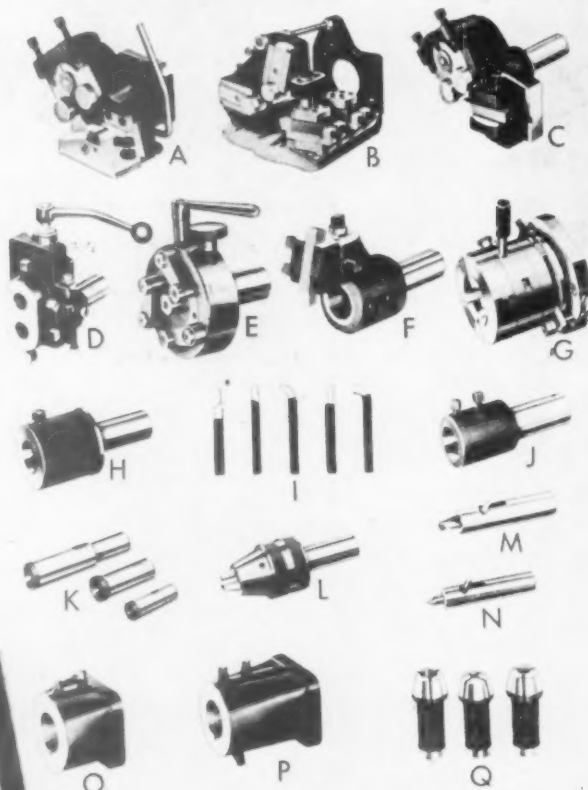
### UNIVERSAL BAR EQUIPMENT

#### Permanent Set-up



### UNIVERSAL BAR TOOLS

- |   |  |
|---|--|
| A. 1 Single Cutter Turner or Universal Bar Turner | J. 1 Floating Tool Holder                      |
| B. 1 Multiple Cutter Turner                       | K. 1 Set Taper Drill Sockets                   |
| C. 1 Combination End Facer and Turner             | L. 1 Drill Chuck                               |
| D. 1 Quick Acting Slide Tool                      | M. 1 Combination Stock Stop and Starting Drill |
| E. 1 Center Drilling Tool                         | N. 1 Combination Stock Stop and Center         |
| F. 1 Adjustable Knee Tool                         | O. 2 Short Flanged Tool Holders                |
| G. 1 Die Head                                     | P. 1 Long Flanged Tool Holder                  |
| H. 1 Clutch Tap and Die Holder                    | Q. 1 Set Collets or Collet Bushings            |
| I. 1 Set of Forged Cutters Square Turret          |  |



Complete descriptions of these tools are found in the Warner & Swasey Tool Catalog. If you do not have your copy, write for it.

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| How to Read a Vernier        | Tapers               |
| Facts about Fits             | Tool-Making          |
| Limits of Tolerance          | Jigs and Fixtures    |
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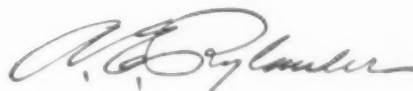
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# Design for Reconstruction

By



TERSELY stated, our country is at war with totalitarian powers, the outcome to decide whether we shall retain our right to self determination or subordinate it to the will of the dictators. In view of superior resources, and the unconquerable spirit of the American people, the reasonable conclusion is that we will eventually decide the issue in our favor. But, what of the aftermath? For surely, post-war Europe will suffer social and economic changes, affecting conquered and conqueror alike, and it is a logical corollary that what has become known as the "American Way" will have to be modified if we are to adapt ourselves to a changing world order.

Since, however, the American Way has been a pattern for the world, it were well that we retain its essentials. And, that necessary changes be under orderly control, and not subject to abrupt transition, it were best that they be effected by a planned design based on a known premise. That premise is that the American way, with its high standards of living, has been made possible by the combination of free enterprise and mass employment at the highest average wages in the world. While the wage average has latterly soared to an all-time high as a result of the war boom, it is a foregone conclusion that the boom will eventually collapse, when we will plunge from a high of false prosperity to a low of equally false depression. That is, unless a medium is designed to cushion the shock. Such a design will be outlined here.

Reduced to simple terms, the plan implies that a foundation for post-war reconstruction be laid while war still rages, reverses a past order in that now, *in time of war, we prepare for peace*. However, it does not imply any deviation from the immediate purpose, which is to win the war. Let that be clearly understood, so that there be no confusion of issues. But, even as it profiteth a man nothing that

he gain the world and forfeit his life, what profit to a nation that it win a war and lose the peace? This time, let us win both. "How?" Well, the whole resolves itself to the simple proposition that *there can be no depression as long as the masses of the people are gainfully employed*. Therefore, the first consideration being mass employment, it is proposed:

(1). That, to insure industrial employment, the workers of America, in all stations and in all vocations, pledge themselves to the purchase of manufactured commodities—as automobiles, furniture, home appliances, etc.—up to one third of their normal, annual income for one year following the cessation of war production.

(2). That the employers in turn guarantee employment to those who so pledge, subject only to temporary lay-offs during change-over from war to peacetime production, and, naturally, contingent upon employee response. To succeed, the plan must be reciprocal and equitable.

If a pledge of one third of income seems severe, consider that two thirds of income accrues to the pledgee which would not be gained were he idle, while the third pledged reverts in tangible goods of equal value. Consider, too, that in normal times the average American industrial worker contracts installment buying that often transcends his annual income. Where, then, is the hardship, especially as compared to the lean years of the past depression? By the plan proposed, the worker like the employer risks little and stands to retain his economic independence.

Well, there are the essentials, but sketchy as the outline, few considerations have been overlooked. It is frankly conceded that engineering talent will be required to evolve product and the tools of production—and right now, American engineering genius is directed to the destruction of enemy powers. But, we also know that there are leaders—the plus

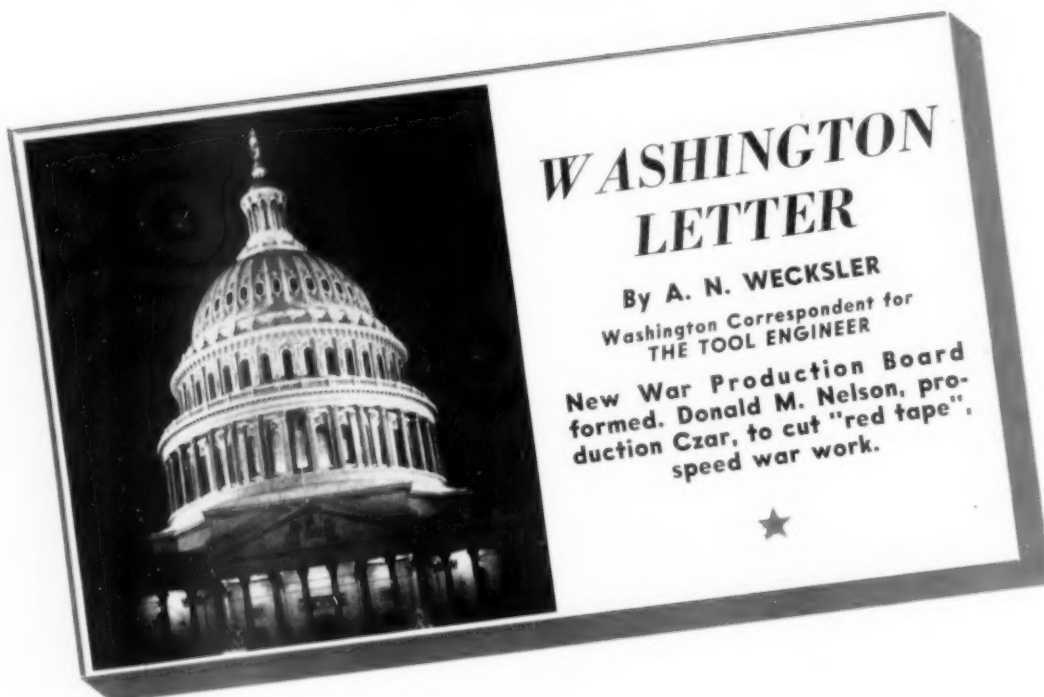
men—who do more than their share, and such leaders will emerge as needed, not to serve two masters but to do dual service for the one.

The market is assured, as shortages becoming the more acute as war progresses must inevitably create an equally keen demand at its conclusion. And, the potential purchasing power will be there if not dissipated during an extended period of idleness. The slack must be quickly taken up. For that reason, first consideration has been given to industrial employment which, in turn, will encourage employment in other fields besides supporting Federal and state projects. Post-war public works projects are doubtless in the Administrative scheme, but such must be supported by public taxation and, at the best, promise but subsistence wages. America wants more than that, wants to retain the American way of life, and we can insure its retention by providing the essential foundation—mass employment at a living wage.

The plan, which is essentially a continuation of the American way, should work if tried. But, it will entail the sponsorship of a powerful organization—as the A.S.T.E.—and the sympathetic support of government to put it across. It may entail an intensive educational campaign for its propagation, certainly work and self denial on the part of the committee or committees assigned to its development. For this work, there will probably be no other reward than the satisfaction of rendering service to humanity. Yet, to a world plunging toward economic nadir as a result of an exhausting war, it gives hope of a future prosperity in which all may share and must share if we are to have international amity and the civilization which only peace can achieve.

Men and women of America, a way out has been delineated, but the goal depends on your support. Will you give it?





**I**N much the same manner found necessary by British industry following Dunkirk, conversion of durable goods industries through pooling of plant facilities and equipment to produce war material is now being planned as a means of obtaining the required war production called for by President Roosevelt.

The central figure directing policy is Donald M. Nelson, as chairman of the new War Production Board, and supervising technical details will be former Office of Production Management Director William S. Knudsen, who has been made Lieutenant General of the United States Army.

Obviously, the first industry slated for large scale conversion is the automotive industry, as with civilian production being brought to a halt, immediate participation in war production becomes necessary, both from the standpoint of utilizing idle tool facilities and absorbing the large number of workmen engaged by this industry.

Peculiarly, the American automotive industry is not as adaptable to conversion as some British automotive plants were, due to the fact that there are more single purpose tools in the automotive industry in this country, in contrast to universal tool facilities in the much smaller British plants.

Conservative estimates of the extent of conversion possible in our automotive industry at first indicated that possibly seventeen percent of existing tool facilities could be converted. Even the most conservative estimates have been revised sharply upward under the impetus of a war crisis. With a pooling of plant fa-

cilities and equipment, obviously the percentage will be much greater and speculative estimates running as high as seventy to seventy-five percent have been suggested. The major problem will be tools and technological and engineering skill.

In addition to the recognized need for large quantities of additional machine and hand tools, ingenuity to adapt existing tools in the automotive and other durable goods plants will be a major problem.

From all indications, War Production Board chairman Nelson plans a vigorous conversion program, and at the same time proposes extreme controls over all scarce raw materials, with the dual objective of conserving such raw materials for essential war needs and of channeling scarce materials directly to war industry.

In line with this policy, all steel alloying materials have during the last month been subjected to further restrictive controls. These controls will increase rather than diminish as the war effort progresses, and as an ultimate result of a full war economy, it can be assumed that as the quantities available decrease in proportion to the demands under a full war economy, a strict accounting of both need and use for all scarce materials will be required. Such control will become more directly aimed at individual users, rather than the current practice of treating industries as units.

The broad mechanics of production of war materials will largely be centered under the Army and Navy Munitions Board, which will rely upon General

Knudsen's technical advice, but the final decision on essential policy governing such factors as pooling of tools and plant facilities will rest solely with War Production Board chairman Nelson, whose authority under President Roosevelt's Executive Order gives him final word over all questions of war production factors.

All official priority actions affecting the *tool industry* during the past month have been directed toward a tightening of controls over both raw materials going into tools and plant equipment and over allocation of tools to the more immediate needs of war industry.

A chronological review of actions affecting the tool industry follows:

December 19—Restriction on the use of alloying material in iron and steel. Amendment to General Preference Order M-21-a prohibits producers from melting any alloy iron or steel containing specified alloying elements in specified amounts, except to fill orders with a rating of A-10 or higher, or by special direction of the Director of Priorities. Alloy iron or alloy steel containing any one or more of the following elements in the following amounts are covered by the restrictions:

Manganese in excess of 1.65 percent; copper in excess of 0.60 percent; chromium in excess of 0.60 percent; molybdenum in excess of 0.60 percent; nickel in excess of 0.60 percent; cobalt, tungsten or vanadium in any amount specified or known to have been added to obtain a desired alloying effect.

December 20 — Preference Rating Order P-73 provides an A-3 rating for essential repair and maintenance and

operating supplies for metal smelting and refining operations; an A-1-a rating for actual breakdown or suspension, and an intermediate rating of A-1-c for advance provision to avert breakdown or suspension.

December 20—Vanadium going into high speed steel for machine tools, special castings, armor plate, placed under complete allocation control, regardless of existing priorities preference ratings under M-23-a.

December 20—Order M-29 and Supplementary Order M-29-a controlling tungsten metal powder, ferro-tungsten and tungsten compounds, extended to June 30, 1942.

December 22—Supplementary Order No. 1 to General Preference Order No. E-1, controlling production and delivery of machine tools extended indefinitely, with indications that a new master preference numerical list was under preparation.

December 23—Announcement of appointment of George C. Brainard, president of General Fireproofing Company, of Youngstown, O., succeeding Mason Britton as head of the Machine Tool Branch of OPM.

December 23—Priority Regulation No. 1 amended requires all purchase orders for materials or equipment which carry a priority rating to be given precedence over purchase orders which do not have a rating. In effect, this amendment made a priority rating a prerequisite to obtaining any but the most plentiful materials (such as lumber).

December 31—Priorities Order M-14 amended to correct an error. Under a preceding amendment, it was required that use of molybdenum and tungsten as alloys in steel be maintained at rates of 75 to 25. At that time, it was intended to cancel other orders to bring them into conformity with this ratio. In contrast to this purpose, the previous amendment stated instead that cancellation for tungsten type steel should be three times that of molybdenum. Amendment issued December 31 corrected this error.

January 1—Preference Rating Order P-11-a under which some manufacturers of machine tools and other metal working equipment have been operating was extended until March 15, 1942.

January 7—General Preference Order E-1-a covering production and delivery of machine tools, gages and chucks changed, revising master preference numerical list, with the objective of controlling deliveries as between various purchasers operating under high preference ratings. Master preference numerical list was not made public. This order was revoked and issued on January 12

(Continued on page 148)

FEBRUARY, 1942

# SIGNALS



## "Everything under control"

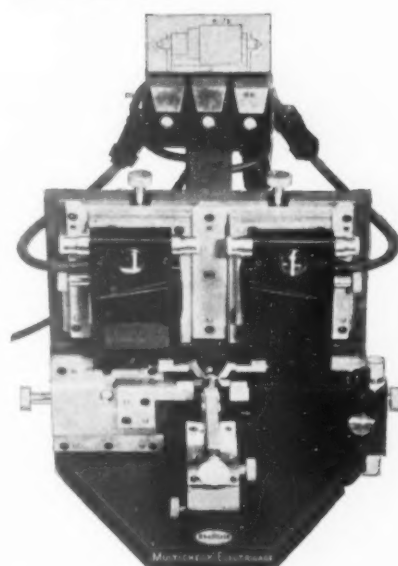
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A signal light showing red indicates its dimension is undersize, green an oversize dimension and amber that the dimension is truly within tolerance limits. When four or more measurements are being checked a master signal may be provided at the top of the panel to show white when all dimensions are correct. Thus the inspector looks only at the master signal unless it indicates trouble somewhere below.

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# PRODUCTION PERSPECTIVES...

News of Mass Manufacturing Everywhere



**P**RESIDENT ROOSEVELT appointed Donald Nelson as chairman of the new War Production Board on January 16. It was the biggest news of the month. It puts all war work in the hands of Nelson who will have "final" powers of decision over Government policies, plans, procedures and methods of procurement and production. He was further empowered to make any changes in OPM that he deemed necessary. The WPB consists of a Chairman, Donald Nelson, the Secretary of War, the Secretary of Navy, the Federal Loan Administrator, the Director General and the Associated Director General of OPM, the Administrator of the Office of Price Administration, the Chairman of the Board of Economic Warfare and the Special Assistant to the President supervising the defense aid program.

Following this announcement came the appointment by the President of the first civilian to be made a Lieutenant General, William S. Knudsen who has been Director of OPM since its formation. He will have charge of the production of munitions for the army. The importance of his job was indicated by the announcement of Secretary of War Stimson that plans were to increase the army to 3,600,000 men in 1942.

The National War Labor Board took over the duties of the former National Defense Mediation Board and now has powers for final settlement of disputes. William H. Davis remains head of the board.

Ernest Kanzler who was a former vice-president of the Ford Motor Company and more recently president of the Universal Credit Corporation has been appointed as production Czar over the automotive industry and is now located in Detroit. Many other OPM production men are making an exodus from Washington and returning to Detroit and other automotive production cities where they can be closer to the job. All of this indicates the change in production perspectives since Nelson has taken hold of the new job.

Virtually all of the 190 plants of the automotive industry will be through with automobile production on Feb. 1. In preparation for the quickest possible change over, the leading executives of the auto industry, plant managers, production men, Tool Engineers, and automotive engineers from the leading automotive, parts supply, tool and die firms, gathered in Detroit on Jan 24.

**A**LVAN MACAULEY, chairman of the Automotive Council for War Production and president of the Automobile Manufacturers Association, presided. K. T. Keller, president of Chrysler Corporation, Paul G. Hoffman, president of the Studebaker Corporation, C. E. Wilson, president, and O. E. Hunt, vice president of General Motors Corporation discussed production and technical services to be rendered by the Council to expedite war production. E. O. Kanzler who attended the meeting was given a rising vote of appreciation for his plea of cooperation.

Following a general session in the morning, a series of small individual meetings followed, where engineers and production experts formulated plans for speeding the output of tanks, airplane engines, bomber airplanes, guns, marine equipment and other war products.

Since the first of the year Chrysler has received orders for military vehicles amounting to nearly \$100,000,000 and Ford got \$84,000,000 worth. From Toledo comes the word that Willys is the first automotive manufacturer on 100 percent war production.

According to Federal Reserve reports the production in-

dex of the machinery business for 1941 was 209 compared with 135 for 1940. According to the National Machine Tool Builders' Assn., the machine tool industry closed the year with shipments in December of \$85,100,000. This was the highest volume of any one month in its history. Output for the year reached \$775,300,000. Production in 1940 was estimated at \$450,000,000. An increase of 72% during the year. The Association estimates that the number employed in machine tool building plants at the end of the year exceeds 110,000 as compared to 78,100 estimated employed in December 1940.

**T**HE worst of the unemployment shock due to the change over in the automotive industry seems to have passed. Wendell L. Lund, director of the Michigan Unemployment Compensation Commission said that there was a decline of 72,747 claims in the week preceding Jan. 24. The previous week the claims amounting to 177,348 were the highest for the period 1939-42. During the first 17 days of January the average paid per day was over \$217,000 making a total of \$3,697,499. This was four and a half times that paid during the like period last year.

How a well equipped, well trained organization can meet the rigid requirements of defense production is evidenced by its class "A" rating. W. M. Weaver, Air Corps Inspector-in-

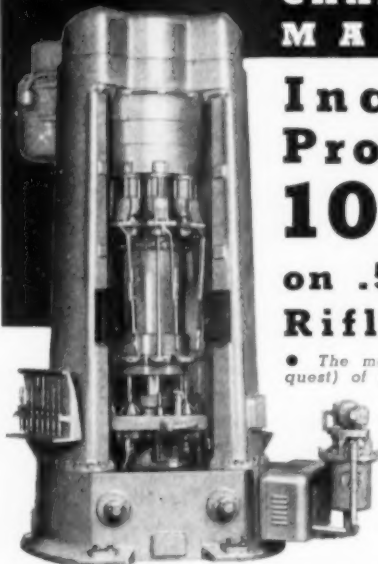
## THE RISING SON



Drawn for THE TOOL ENGINEER by Ted Petok  
"I always work better with someone looking over my shoulder"

# NEW!

## HYDRAULIC RIFLE BARREL CHAMBERING MACHINE



**Increases  
Production  
10 TIMES  
on .50 Caliber  
Rifle Barrels**

• The manufacturer (name on request) of this outstanding chambering machine has selected John S. Barnes hydraulic engineering, and standard Barnes hydraulic elements to insure smooth, positive feed. The hydraulic pumps, valves and other circuit elements are manufactured by John S. Barnes Corporation.

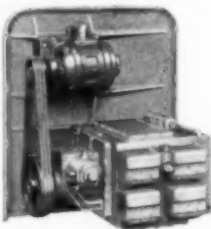
• This successful hydraulic machine design has made it possible to chamber ten times as many rifle barrels as previously done with hand-fed methods. The primary hydraulic requirement for the job was a smooth, vibration-free feed which could be used to actuate a circular disc carrying cams for feeding nine tools.

### STANDARD UNITS FOR YOUR SPECIAL CIRCUITS

The complete hydraulic circuit for this machine is entirely new—designed for this machine alone. However, the pumps, valves, control panel and other basic elements are from our standard line of time-tested units.

### TWO IMPORTANT BENEFITS

By consulting our engineers for a HYDRAULIC APPLICATION you can benefit through their experience with complex circuits for unusual machine cycles. You can be assured of the final success of your machine design, and its successful operation in production, through the use of standard Barnes units. Hundreds are in use in mass production equipment in all of our automotive industries. Maintenance costs are practically nil. For additional data write for the booklet offered below.



This compact Barnes hydraulic unit controls the function of five cylinders used on the chambering machine. The feed cylinder imparts a smooth steady feed to a rotary disc which carries the cams for feeding the individual tools. Other machine functions controlled hydraulically are: work indexing, clutch engaging, index pin actuation, and rapid approach of rifle barrels to the tools.

Some present users: Manufacturers of Machine Tools, Woodworking Machinery, Riveting Machinery, Printing Presses, Electrotape Shavers, Coal Mining Machinery, Valves.

**FREE New Data:** Included in this 40 page book are typical installation circuits, complete data covering piston and gear pumps and complete information covering basic elements of construction and installation of standard units used in these highly successful hydraulic circuits. Write for your copy today. Ask for Bulletin T.E. 142.



## John S. Barnes Corporation

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## —PRODUCTION PERSPECTIVES—

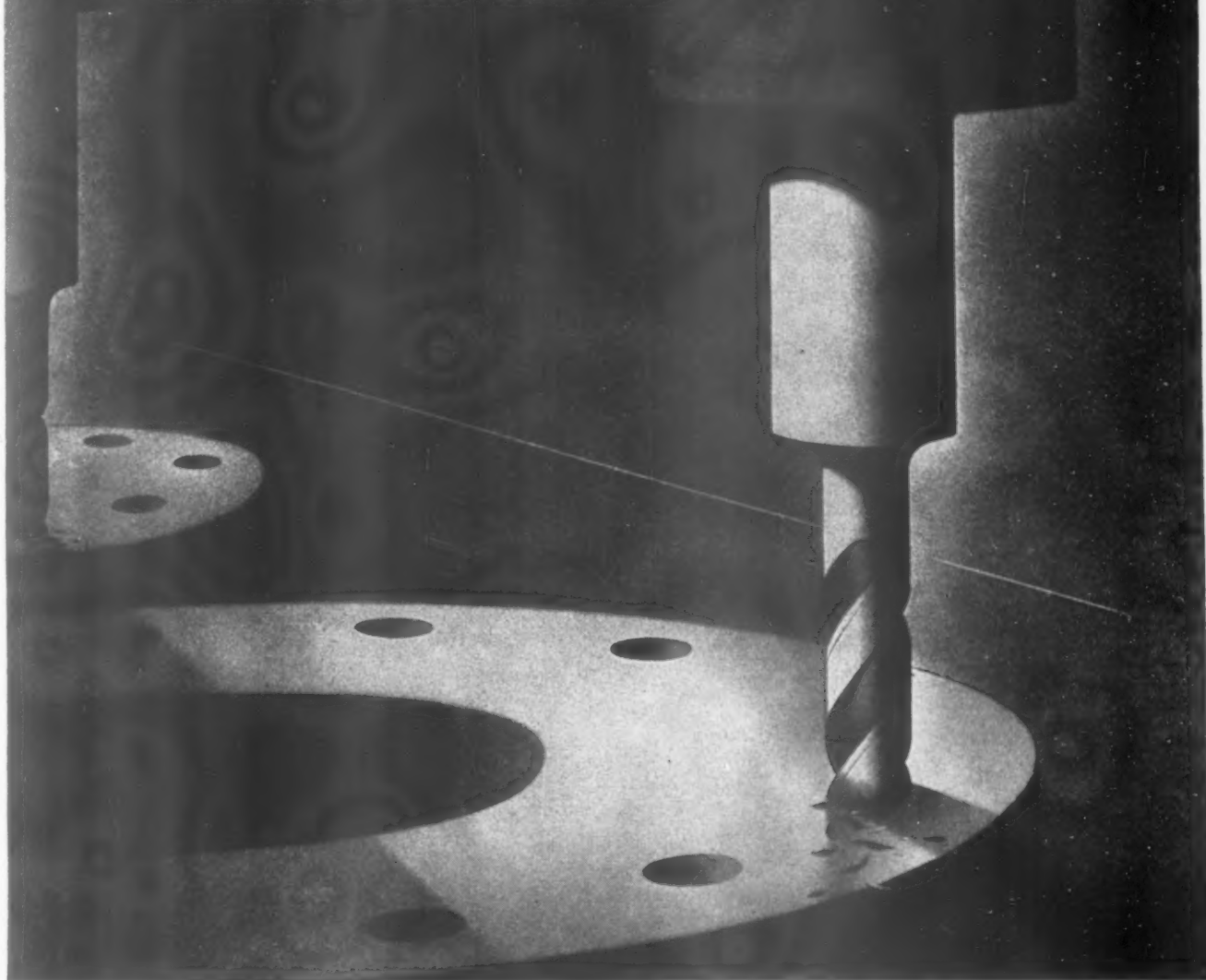
Charge at the plant of The Aro Equipment Corporation of Bryan, Ohio, announced that the company has been awarded this rating for excellence of manufacture by the Materiel Division of the U. S. Army Air Corps. This rating has been made possible by establishment of "Quality Control" and indicates that the Production and Inspection organization has demonstrated that it can be entrusted with full responsibility of meeting all requirements as established by the Air Corps. Inspection of detailed fabrication is eliminated and the Air Corps Inspectors can confine their activities to general supervision of the inspection system to the extent of assuring that an acceptable product is delivered. According to Mr. C. W. Ginter, Works Manager at the ARO factory, Mr. J. H. Larsen, Factory Superintendent, and Mr. H. E. Morton, Chief Inspector, are accorded a great deal of credit for this fine showing.

WESTINGHOUSE announced a license agreement, authorizing the Joshua Hendy Iron Works of Sunnyvale, Calif., to use its plans and processes to produce marine turbines, gears and auxiliary apparatus. This will speed up production for the Navy and the U. S. Maritime Commission by helping a California firm to build vital propulsion equipment. Engineers from this company will observe manufacturing operations in the Westinghouse South Philadelphia works, where propulsion equipment for more than 100 Navy fighting ships and a large number of merchant vessels is being manufactured. This is the first west coast firm to manufacture turbine geared propulsion equipment. Westinghouse was the first turbine manufacturer in the United States. Steam turbines were first developed to drive electric generators and the machine was later adapted by Westinghouse engineers for marine use. The first geared turbine unit for the Navy was installed by Westinghouse in 1911. Some of the most accurate manufacturing processes in heavy industry are required to build marine turbines and gears. Each turbine contains thousands of precision-finished steel blades. Big marine gears are cut in air-conditioned rooms so that outside temperature changes will not affect the finish. Gears are machined to a tolerance of one one-thousandth of an inch, one-half the thickness of paper.

Existing machinery to assist discharged Selective Service recruits in obtaining re-employment at their old jobs was reviewed in Detroit by Governor Van Wagoner's Wayne County Central Reemployment Committee. The Committee emphasized the fact that machinery exists now to help workers get their jobs back. Each Selective Service Board in Michigan (192) has a Reemployment Liaison officer whose duty it is to assist released selectees in returning to employment. In addition, Lund, Chairman of the Committee, explained, the Unemployment Compensation rights of selectees are "frozen" for the duration of their services in the armed force and is made available to them on their release if they are unemployed and still eligible.

FROM Archibald MacLeish, director of the Office of Facts and Figures comes the information that restriction of less essential civilian production is expected to divert an estimated 20 billions of productive capacity to war use. Plants will be converted not only from manufacturing of automobiles to making tanks, but from fountain pens to fuses, from rat traps to camp cots, from pipe fittings to hand grenades, from lawn mowers to shrapnel, from women's lingerie to mosquito nets. To make certain that the available raw materials go for production of first things,—munitions-production cuts have already been ordered for radios, ice boxes, washing machines, lawn mowers, garden rakes, paper containers, fancy galoshes, and juke boxes. Ample provision, however, has been made for spare parts and replacements to extend the life of durable machinery now in use in both homes and shops. The produc-

**Production doubled with  
Molybdenum high speed steel**



The working efficiency of Molybdenum high speed steels is a matter of record in hundreds of shops. The following is an example of what a changeover to a Molybdenum high speed steel accomplished in one plant.

**Operation:** Drilling holes  $1\frac{1}{8}$ " diameter  
by 7" deep.

**Material:** Manganese steel (1320).  
**Hardness:** 32 Rockwell "C".

The Molybdenum high speed drills on this job increased production between regrinds 100%.

Your supplier can help you select the type of Molybdenum high speed steel best fitted for meeting your production requirements.

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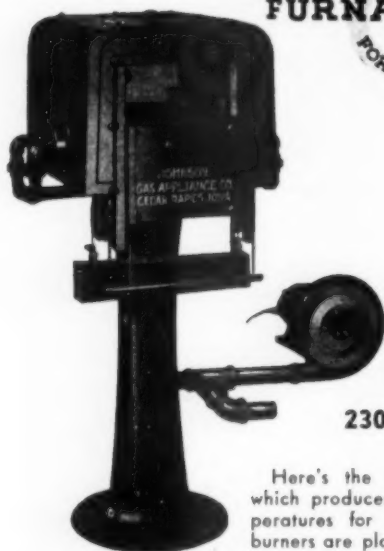


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- Up to 2½ Production Hours
- Up to 50% on Gas Bills
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FOR MORE THAN 40 YEARS



**Johnson No. 130  
Heat-Treating  
Furnace Reaches  
2300° F. in 22 Minutes**

Here's the compact, efficient furnace which produces quick, accurate high temperatures for high speed steels. The 4 burners are placed correctly to offer maximum temperatures in the shortest time—speeding production, and cutting your costs. Equipped with G. E. motor and extra large Johnson Blower. Firebox size is 13" x 13½" x 5½", and fire box is heavily lined with insulating refractory. Priced at \$260\* F. O. B. Factory. Also available in other sizes, and built to your own specifications. Write for more facts.

### Johnson No. 550 Pot Hardening and Melting Furnace SAVES ON GAS

Precision engineered for economical salt, cyanide and lead hardening. Furnished with G. E. motor and Johnson Blower, lid, derrick for lifting lid, and 8" x 10" steel pot. Can be used by tool and die makers for case hardening and by pattern and model makers for melting. \$125\* F. O. B. Factory. Quotations furnished on request for other pot sizes.



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## PRODUCTION PERSPECTIVES

tion of new farm equipment was reduced to 83 percent of normal. The quota for replacement parts was raised to 150 percent of normal. Since Pearl Harbor, cotton and synthetics are taking the place of silk and jute for burlap.

Two types of lead-silver solders containing no tin are finding increasing use. One of these is the alloy which contains 2½% silver and 97½% lead. It flows at about 580 deg. F. The other is a proprietary alloy composed of 2.5% silver, 0.25% copper and 97.25% lead. It starts to melt at about 580 deg. F. and flows at about 661 deg. F. These are relatively "soft" solders and should not be confused with the silver brazing alloys and "hard" silver solders having melting points of 1175 to 1600 deg. F. The use of the above lead-silver soft solders for cans and other containers, according to the report of the American Silver Producers' Research, points out that a lead-silver solder containing 2.5% silver costs less than lead-tin solders in which the tin content is above 25%. This is significant, since the much used tin-lead soft solders contain 50% of tin. As the lead-silver solders have higher melting points than the lead-tin solders, higher temperatures can be applied in baking synthetic coatings used as linings, especially in beer cans. Since there is sufficient silver in the world market, silver is receiving consideration as a possible replacement for other metals the supply of which is restricted.

President K. T. Keller of Chrysler Corp. announced the receipt of a Government order for 80,000 new type Army vehicle estimated to cost between \$80,000,000 and \$100,000,000. Keller said the new order would provide approximately 12,000,000 hours of work for about 25,000 employees of its Dodge main plant and Dodge truck plant and the Highland Park plant of Chrysler Corp. Details of the new type army vehicle were not disclosed but Keller said it was developed by Chrysler engineers and will be powered with a Dodge motor.

An immediate government appropriation of \$100,000,000 to develop synthetic rubber was urged at New York by Dr. Harry N. Holmes, head of the Oberlin College chemistry department, as he assumed the presidency of the American Chemical Society. He declared that scientists must teach the public the importance of permanent stock piles of strategic materials, and said the consequence of such materials was "on the same level in our military picture with armies, fleets and aircraft."

UNCLE SAM'S air craft manufacturers, reporting through the Aeronautical Chamber of Commerce, have disclosed that in 1941 they built more than \$1,500,000,000 worth of warplanes, engines and propellers—a record—and that in 1942 they hope to double that production in the all-out fight against the Axis. The 1941 figure nearly tripled the 1940 production of \$544,000,000, said John H. Jouett, chamber president, at Los Angeles. "The Aircraft industry pledges it will not relax its utmost efforts until the war is won. It is our firm belief that we can continue to produce enough aircraft so that they will be a decisive factor in the war on all fronts." To support his belief, Jouett cited the rapidly organized seven-day week, 24-hour-a-day plant operation program. Approximately 425,000 men and women now are working in aircraft factories, as against 193,000 on January 1, 1941. Opening of several new plants during 1942 will bring the total number of workers to 575,000.

Contracts totaling \$3,642,425 for construction of five more units of the government's airplane engine research laboratory at Cleveland Airport were let January 2 to the Sam W. Emerson Co. The awards are on a cost plus fixed-fee basis and were made after hearings held by the National Advisory Committee on Aeronautics.

## For Rush Tooling Brazing Your Own Carboloy Tools

When you need tools in a hurry—when a job demands immediate tooling—mill, braze and grind your own Carboloy tools! Three simple operations, done in your own tool room—and the tool is on the job. It's *fast*—less than an hour is required for most single-point, straight-shank tools.



It eliminates ordering time and "hold-ups" awaiting deliveries.

Keep a stock of Carboloy Standard blanks in your tool crib... ready at a moment's notice to make up tools. You simply recess a shank to accommodate the Carboloy blank—braze in the blank—and grind the brazed tool.



Typical Carboloy tools made by a brass goods manufacturer.

With these three simple steps you're prepared to meet emergency tooling immediately.

A new 32-page Carboloy Tool Manual, No. GT-133, shows you exactly how to do the job and also



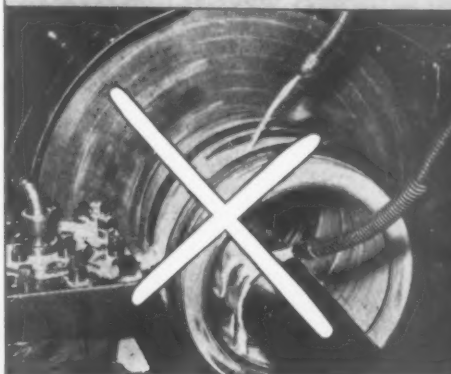
STANDARD  
CARBOLOY  
BLANKS

65 SIZES  
2 STYLES  
3 GRADES



contains data essential for subsequent use and maintenance. This manual, with Carboloy Standard Tool and Blank Catalog, No. GT-140, listing Carboloy Standard Blanks—65 sizes, 2 styles, 3 grades—sent upon request.

## When You Use Coolant with Carbide Tools — Use **PLENTY** of It!! —



A weak stream of coolant is ineffective and results in reduced tool life.



An ample volume of coolant at high velocity carries away heat rapidly and continuously.

**T**O INSURE best results when you use coolants with cemented carbide tools, always provide an ample flow of sufficient volume and velocity to reach, and adequately cool, the cutting edge of the tool. A weak, thin stream may often do more harm than good since the high speeds used with carbide tools—usually above 200 feet per minute—may cause most of the coolant to be carried away from the work before it reaches the point of the tool.

If you want to provide best possible conditions for efficient use of coolants do these two things:

1. Make sure that coolant pump, tank, and supply pipes are of sufficient capacity to maintain large flow at high velocity without appreciable rise in coolant temperature.
2. Make sure that coolant is actually reaching the cutting edge of the tool by providing adequate velocity and directing flow along an unobstructed path directly towards point of tool.

USE  
VITAL  
**CEMENTED  
CARBIDES**  
EFFECTIVELY!

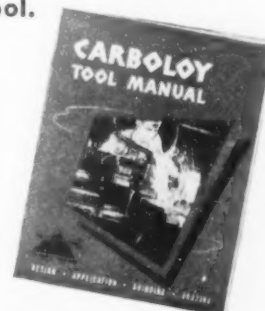
For complete details and sketches, consult page 20 of Carboloy Tool Manual No. GT-133, available upon request, without obligation.

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CORE BITS • MASONRY DRILLS  
• WEAR RESISTANT PARTS •  
**CARBIDES**

FOR THE MANUFACTURING • MINING • TRANSPORTATION • CONSTRUCTION INDUSTRIES

Standardized carbide tools used for 89 per cent of production jobs. How this is done economically without holding up production in a big "job lot" shop, is told herein.

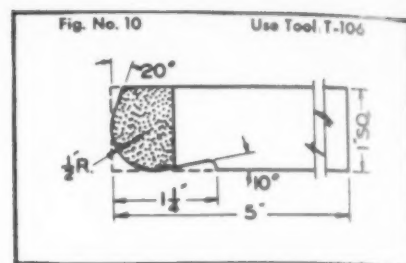


Figure 1  
Typical reground standard tool.

## How Falk Corporation has standardized carbide tools

RECOGNIZING that when defense production got rolling, there was an excellent chance that the tremendous demand for cutting tools might create shortages or at least involve delivery delays on cutting tools, Falk Corporation of Milwaukee, Wisconsin, some time ago set about to reduce any chance of 'bottlenecks' to the absolute minimum possible.

Today, Falk Corporation is reaping the benefit. Not a 'mass' producer of a few parts, but virtually a 'job lot' manufacturer of such items as speed reducers, flexible couplings, herringbone gears, etc., Falk's output today is turned over 98 per cent to defense work, and production-wise it is one of the smoothest running plants in defense industry.

Some idea of the tool problem involved at Falk may be gathered from the fact that while the Corporation employs some 2500 men, its production runs of identical parts range from 5 to 200 pieces. To keep the plant operating at top efficiency, not only must output per machine hour be high, but tools must be gotten to the job fast, to reduce down time. Without a minimum of down time there could be but little gain from maintaining a high output per machine while machines are actually in operation.

Fundamentally, what Falk Corporation did to solve its tool problem was:

1. Using carbide tools wherever possible

to obtain maximum output per machine hour and man hour. Approximately 75 per cent of all Falk's machining jobs are tooled either wholly or partially with Carboloy.

2. Using "standard" tools wherever possible to avoid delivery delays and permit "stocking".

3. Where specially shaped tools are needed, making these up from standard tools wherever possible. Today, 89 per cent of all Falk's carbide tools are either standard tools or tools "adapted" from standards.

Where standard tools could not be adapted, Falk followed the policy, wherever possible, of making up its own tools by brazing standard Carboloy blanks, carried in stock at Falk,

to special shanks. This accounts for another six per cent. The balance of 5 per cent comprises multi-cutters and the few strictly special tools which could not be eliminated.

Incidentally, decision to use carbide tools wherever possible has had a not inconsiderable influence also on Falk Corporation's purchases of new machine tool equipment recently, since all such equipment is specified to be able to operate at the speeds required to take full advantage of carbide tooling.

To administer its tooling program,

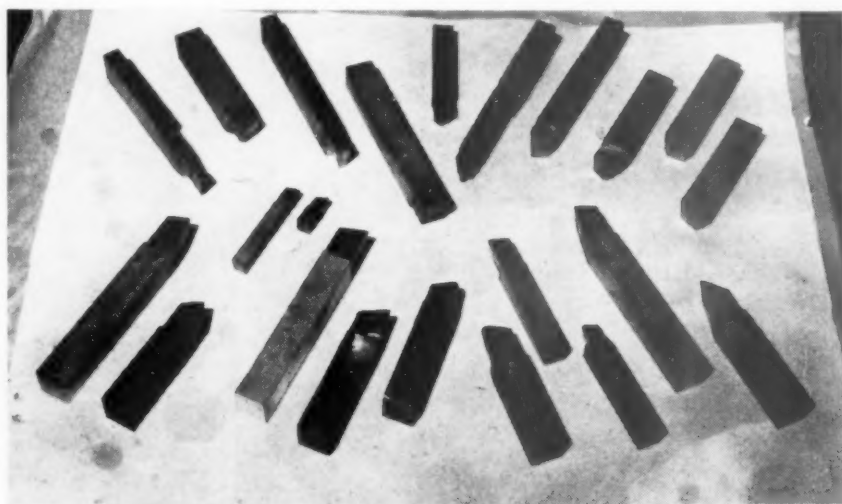


Figure 2  
Various standard carbide tipped tools ground for special purpose applications at Falk plant.

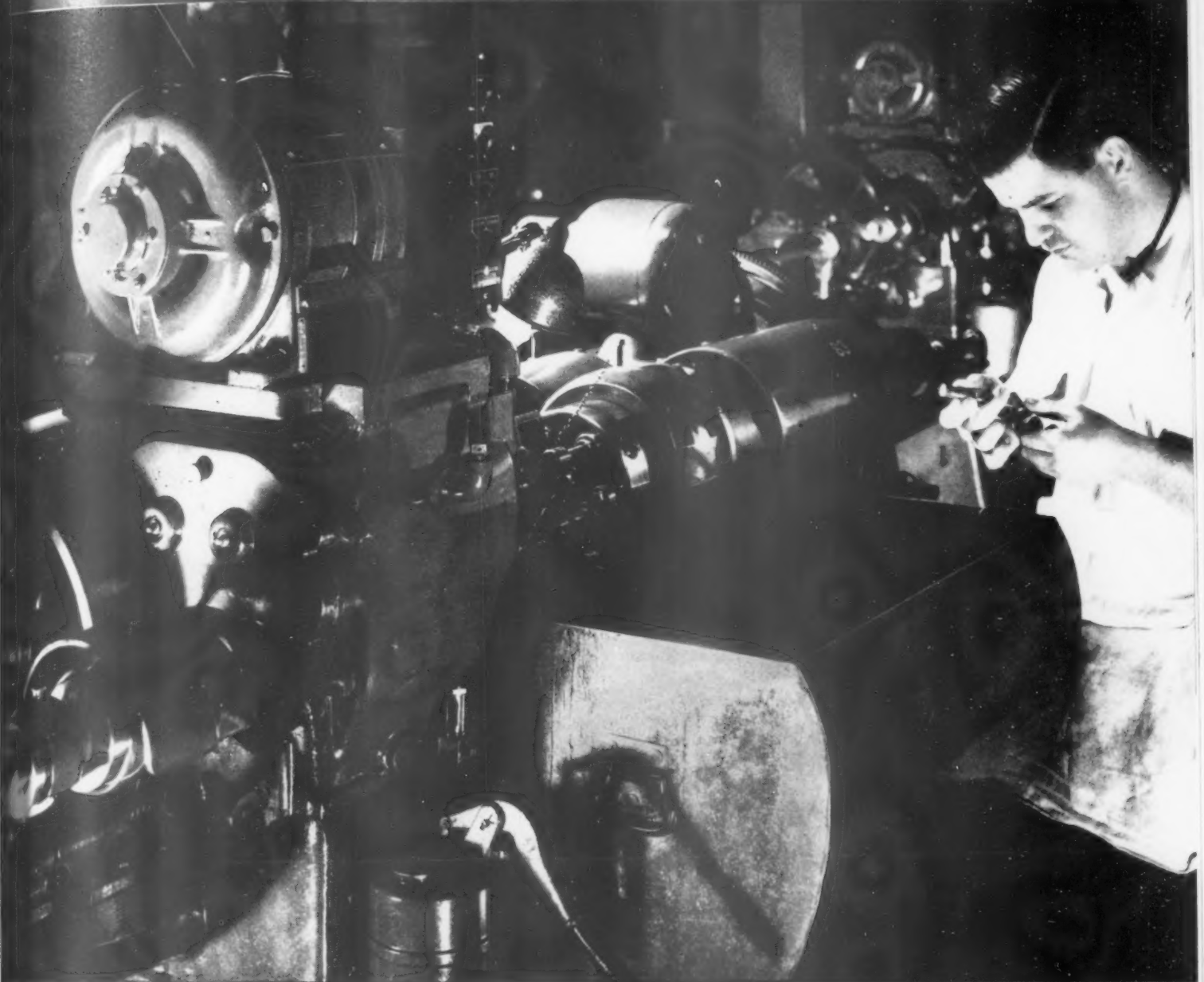


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WITH *Single Spindle* AUTOMATICS



*Martin*  
AIRCRAFT



● Producing precision parts of Martin bombers in quantity calls for high speed production of *small lots and short runs* of a wide variety of parts—a job made to order for Cleveland *Single Spindle* Automatics. And here is one of a large battery of Model A Clevelands recently installed in the Martin plants at Baltimore—kept steadily at work since they were installed. Still more Clevelands are being built for Martin as well as for virtually every other large aircraft builder in this country, in sizes from  $1\frac{1}{8}$ -inch up to 8-inch capacity. Ask for information to enable you to consider Clevelands in regard to your own *small lot, short run* production.

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CLEVELAND  
*Single Spindle*  
AUTOMATICS

Falk has created the position of a Carbide Tool Engineer in its plant. Through this man clear all questions relating to carbide tools, including re-quisioning of tools and blanks, tool design, tool grinding, tool application and stock maintenance.

### Tool Selection

Eighty-nine per cent of all of Falk's carbide tool requirements today are taken care of by only nine styles of standard tools, either by using these tools "as is" or by converting them into special shapes by simple grinding operations.

Figure 2 for instance shows some of the varieties of tools produced from Carboloy standard tools. The entire top row, for example, contains variations of style 1, indicating the wide flexibility possible. Falk's experience has shown that in addition to the vast saving in time afforded by elimination of special tool orders, there is also a considerable saving in cost. For instance, Figure 1 shows in solid lines a special tool obtained from the original standard (shown in dotted lines) by grinding.

The grinding procedure is as follows:

1. Using straight aluminous oxide wheel, rough radius, 10° clearance on steel shank only.
2. Using 60 grit silicon carbide straight wheel, rough radius and 20° and 10° angle on tip.
3. Same as No. 2 but using 60 grit silicon carbide cup wheel to straighten out concave surfaces left by straight wheel.
4. Using 60 grit silicon carbide cup wheel, rough top rake.
5. Using 240 grain diamond wheel, sharpen top, radius, side and front of Carboloy tip, establishing 8° relief all around.

Total grinding time is claimed to be only around 12 minutes. Total cost of the tool thus produced, including normal overhead on grinding labor is only \$6.90 for the finished tool, whereas the same tool ordered as a 'special' from a carbide tool manufacturer would have cost around \$11 or \$12. The big saving of course lies in the fact that the standard tools are mass-produced, permitting a lower cost to the purchaser.

On all special shapes at Falk, unless specified, tools are ground to the following angles (otherwise, standard tools are used "as is"):



**Figure 3**  
Carbide Tool Engineer or regular operator instructs apprentice how to set up and handle a new job.

Secondary Clearance, side and front of shank .....	8 deg.
Carboloy tip clearances .....	5 deg.
Top side rake .....	8 deg.
Chip breaker (Ground in) .....	6 deg.

In connection with chip breakers, the following standard dimensions have been adopted:

For depth of cut: .....	$\frac{1}{8} \times \frac{1}{8}$	$\frac{1}{8}$ to $\frac{1}{2}$
Width of breaker: .....	$\frac{1}{8}$ in.	$\frac{1}{4}$ in.
Depth of breaker: .....	.009 in.	.012 in.

### Tool Supply Control

To control the use of carbide tools at Falk, two 'tool storages' are employed. Into the first store, which acts as a reserve, go all new tools. When the quantity of any tool style in stock has dropped to 15, a new supply of that style is ordered.

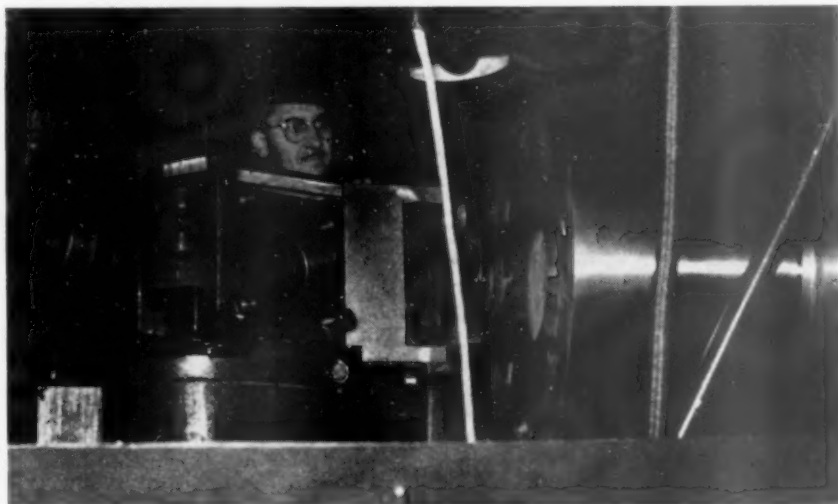
All used tools go into Tool Storage No. 2, including both standard tools and converted standards. For operations where special shape tools are

periodically required, the necessary tools are held together in sets for re-issue as a unit.

All special shapes are produced from used tools. Frequently such special shapes are produced from fairly similar special shapes which are no longer required in production, thus further reducing grinding time.

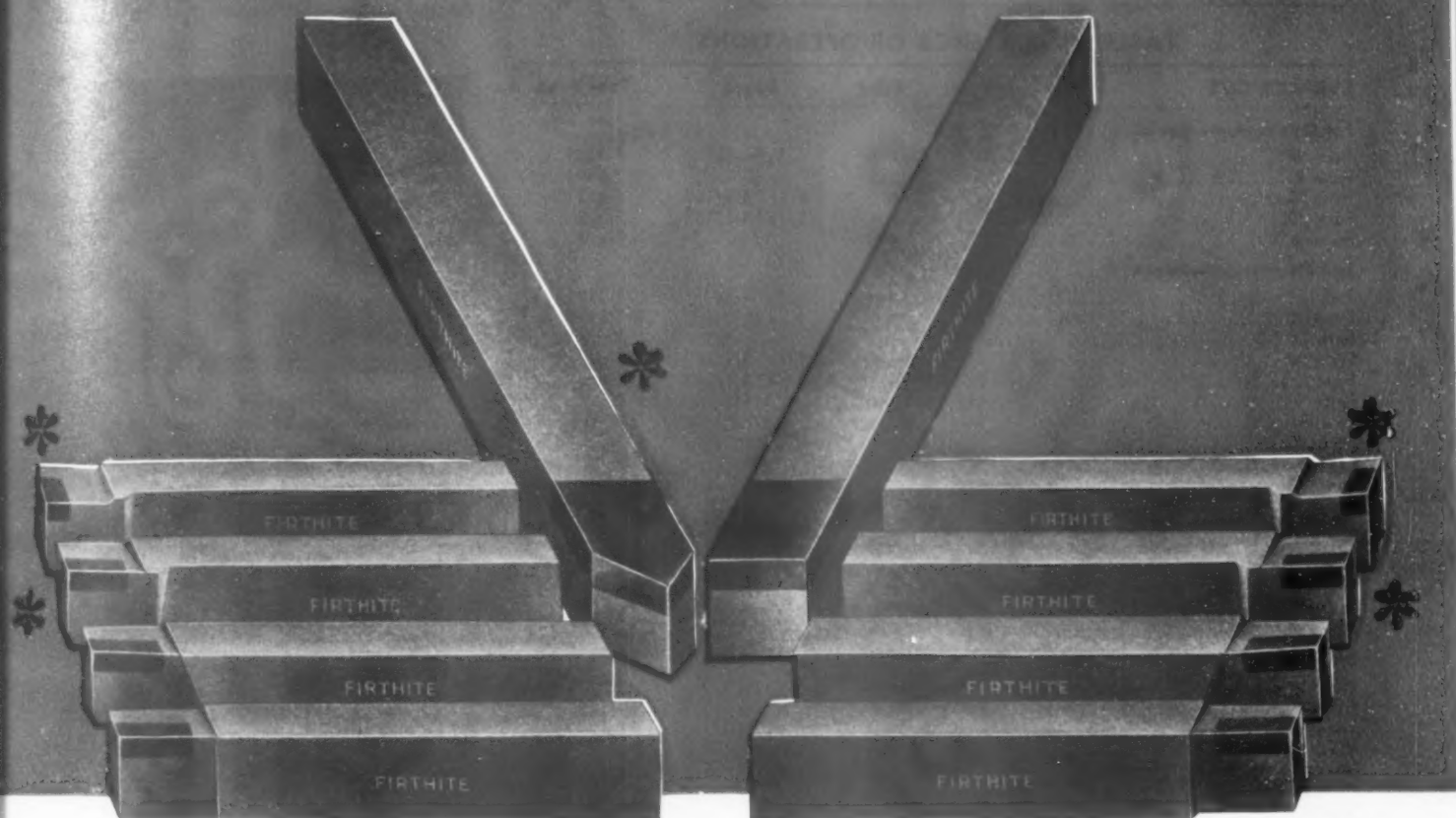
Grinding of tools is completely centralized and tools are ground prior to re-issue rather than 'as returned'. In this manner re-grinding of tools which may not be needed again is avoided, an important factor in a plant where so wide a variety of types and sizes of products is turned out in 'job lot' quantities as at Falk.

In issuing tools to operators, three copies of tool orders are made out, one of which goes to the operator while the other two go to the Tool Engineer.



**Figure 6**  
Facing large cast steel gear blank with Carboloy tool on Gisholt lathe.

# NOW AVAILABLE... 5 NEW\* STYLES OF FIRTHITE GENERAL PURPOSE TOOLS



Five new Tool styles have been added to the FIRTHITE General Purpose Tool line to make a total of 10 styles . . . each in four to ten sizes and four standard grades of FIRTHITE Sintered Carbide.

"G.P." Tools are available *now* . . . from *stock*. This expanded line includes two new offset designs (in

both right or left hand) and a diamond point style of wide usefulness.

Through these additions, the range of work has been broadened to include almost any turning, facing, boring, chamfering, undercutting, back-squaring, or grooving operation *without tool modification*.

Write for full information.

*Send for this*

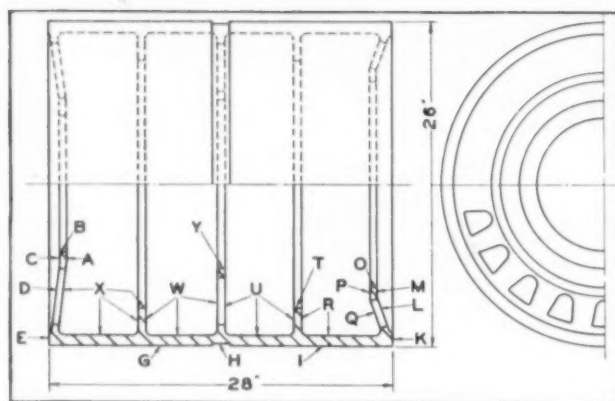
This new FIRTHITE General Purpose Tool Price List is just off the press. Send for it today.



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**Figure 4**  
Details of cast  
steel gear blank  
referred to in  
this tool story.

**TABLE I—SEQUENCE OF OPERATIONS**

SURFACE CUT	R.P.M.	Feed	Depth	Tool Used
<b>1st Operation—Rough</b>				
Turn G	51	.015	1/4"–3/8"	*See note below T-1304
Face E	51	.015	1/4"	T-1404
Face C	51	.015	3/16" & 1/16"	Fig. 2
Face D	51	.004	3/16" & 1/16"	Fig. 2
Face A	51	.015	1/16"	Fig. 4
<b>2nd Operation—Rough</b>				
Turn I	51	.015	1/4"–3/8"	T-1304
Face K	51	.015	1/4"	T-1404
Bore O-Y-B	51	.008	1/4"–3/8"	Kelly-Bar
Face M	51	.015	3/16" & 1/16"	Fig. 2
Face L	51	.004	3/16" & 1/16"	Fig. 2
Face P	51	.008	1/16"	Fig. 8
Bore R	38	.015	7/16"	Figs. 1-5-6
Bore U	38	.015	7/16"	Figs. 1-5-6
Bore W	38	.015	5/16"	Figs. 1-5-6
Face U-l	51	.004	1/4"	Fig. 3
Face W-s	51	.008	1/4"	Fig. 3
Face R-s	51	.008	1/4"	Fig. 3
Face U-s	51	.008	1/4"	Fig. 4
Face W-l	51	.008	1/4"	Fig. 4
Face X-s	51	.008	1/4"	Fig. 4
Face Q	38	.008		Stellite
Face X-l	23	.008		H.S.S.
<b>3rd Operation—Finish</b>				
Turn G	51	.015	3/32"	T-1304
Face E	51	.015	1/16"	T-1404
Rough H	51	.015	1/16"	Ch-13767-A
Finish H	51	.015	1/16"	T-104
Face C	51	.015	1/16"	Fig. 8
Face D	51	.004	1/16"	Fig. 8
Face A	51	.015	1/16"	Fig. 4
<b>4th Operation—Finish</b>				
Turn I	51	.015	3/32"	T-1304
Face K	51	.015	1/16"	T-1404
Face M	51	.015	1/16"	Fig. 3
Face U-l	51	.015	1/16"	Fig. 3
Face M-U-l-A	51	.015	1/32"	Figs. 13 & 14
Bore O-Y-B	51	.015	1/4" & 1/32"	Kelly-Bar
Bore 1/2-R	51	.008	1/16"	Fig. 11
Bore 1/2-U	51	.008	1/16"	Fig. 11
Bore 1/2-W	51	.008	1/16"	Fig. 11
Bore 1/2-X	51	.008	1/16"	Fig. 11
Bore T	51	.008	1/16"	Fig. 11
Face R—Form Rad.	51	Hand	1/16"	Fig. 7
Face W-s—Form Rad.	51	Hand	1/16"	Fig. 7
Face U-l—Form Rad.	51	Hand	1/16"	Fig. 9
Face P	51	.015	1/16"	Fig. 8
Bore 1/2-R	51	.015	1/16"	Fig. 12
Bore 1/2-U	51	.015	1/16"	Fig. 12
Bore 1/2-W	51	.015	1/16"	Fig. 12
Bore 1/2-X	51	.015	1/16"	Fig. 12
Face U-s—Form Rad.	51	Hand	1/16"	Fig. 8
Face X-s—Form Rad.	51	Hand	1/16"	Fig. 8
Face W-l—Form Rad.	51	Hand	1/16"	Fig. 10
Face L	51	.004	1/16"	Fig. 8
Face Q—Form Rad.	51	.004	1/16"	Fig. 10
Face X-l—Form Rad.	23	Hand	1/16"	H.S.S.

s—short side  
l—long side

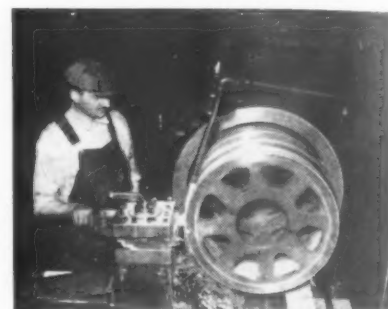
\*Figure numbers given in column "Tool Used" refer to numbers given in standard Falk carbide tool drawings, Figure 5, page 85.

These are held until tool is returned permanently to the crib.

When returned for re-sharpening the tool is chalked with the operation number. When the tool is worn out, or if lost or broken, a special slip is made out in duplicate, one copy going to the Carbide Tool Engineer, and one copy to the head office.

### Tool Set-up Supervision

Insofar as possible, operators make their own tool set-ups, although this comes under the supervision of the



**Figure 7**  
Turning the OD of steel gear blank  
on another Gisholt lathe.

Carbide Tool Engineer. Where an operator is not thoroughly familiar with the set-up requirements, this Tool Engineer is called in.

To avoid confusion, whenever a new carbide tool is started on a job for the first time, a standard 'starting' cutting speed of 180 feet per minute and a standard feed of .010 on smaller machines and .015 on larger machines is used.

Speeds and feeds are later modified by the Carbide Tool Engineer and operator on the basis of productivity, tool economy, and a study of the quality of work produced.

In tooling up a job, Carbide standard tools No. 13 or No. 14 are automatically specified for all through



**Figure 8**  
Machining the pinion bearing for  
Falk main reduction gears.

THE TOOL ENGINEER



**Figure 9**  
Boring a cast steel hub on a Gisholt 4L lathe.

turning, while turning to shoulder is all handled by Carboly styles No. 4 or No. 7.

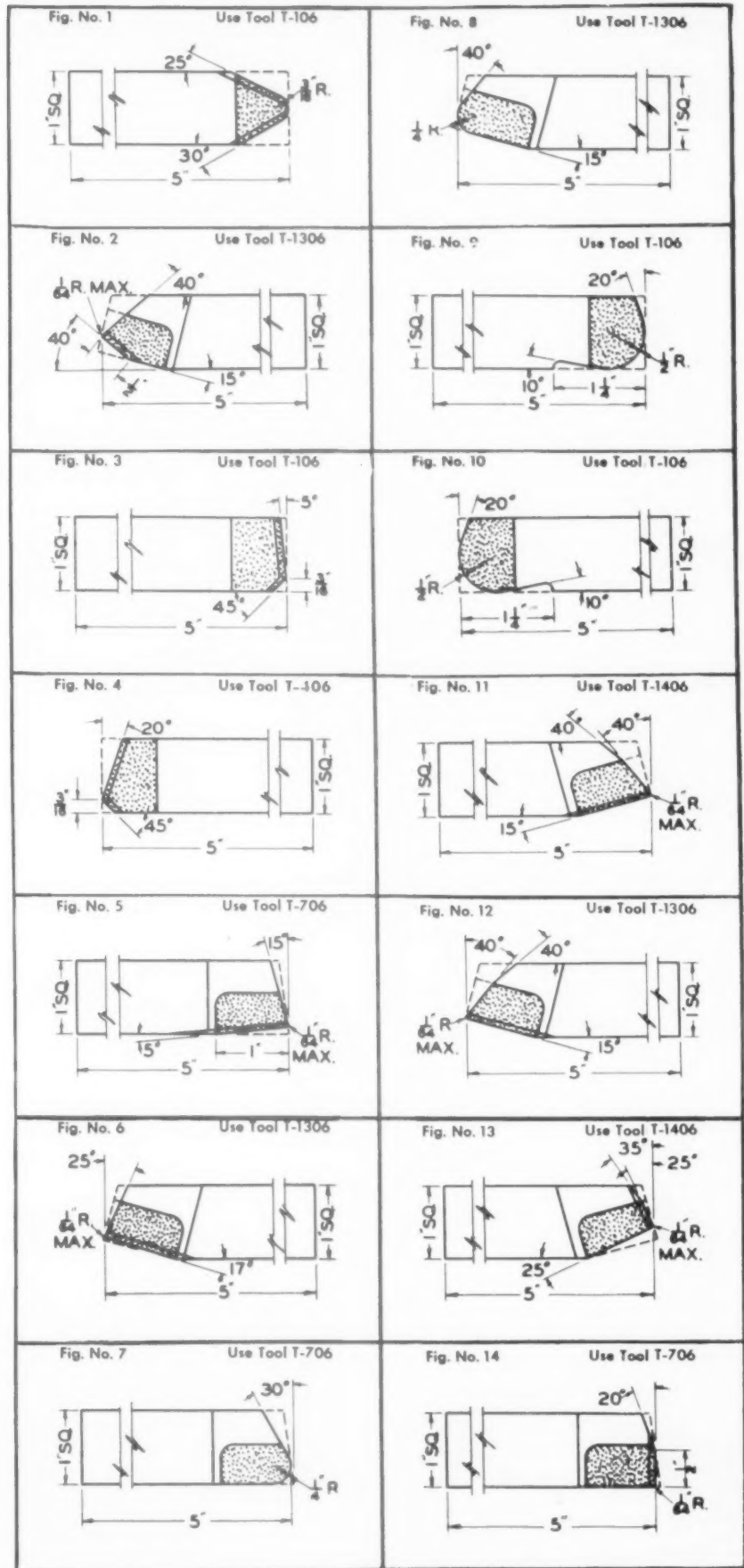
Falk machine operators are given as much responsibility as possible in connection with their machines. This includes even the training of apprentices. *Figure 3* shows an apprentice being instructed by an operator in the performance of a specific operation which the operator himself has been performing heretofore.

### In Practice

The manner in which tooling is handled in practice is illustrated in *Figures 4 to 8*. *Figure 4* shows a drawing of the part to be produced, a cast steel blank for a large 'first reduction' herringbone gear. In Table I, is given the sequence of operations to be performed, including rpm of work, feed, depth of cut, number of cuts to be taken, and tool to be used. Where tool numbers are given, these correspond to Carboly standard tool numbers, while the "Fig." designations correspond to the modifications of standard tools shown in *Figure 5*. Each of these shows the 'standard' Carboly tool number from which the special shape was obtained. Average grinding time is said to be 4 to 15 minutes per tool.



**Figure 10**  
Finishing a steel sleeve with maximum runoff of only .001 inch.



**Figure 5**  
Dimensions and shapes of standard Falk carbide tools.

The first two operations in Table I, take place before, while the 3rd and 4th are performed after heat-treating the blank. The material is a particularly tough cast steel. Typical of the operations performed are those shown in *Figures 6 and 7*, the first illustrating the facing of the gear blank, while the second shows one of the turning operations on the OD. All of these operations are performed on Gisholt turret lathes.

Incidentally Tool No. 10 in *Figure 5* is the same tool as the one shown in



**Figure 11**  
Finish so fine with carbide tools that grinding is often eliminated.

*Figure 1*, under the discussion of tool costs.

### Other Applications

*Figure 8* shows one of the operations in machining the pinion bearing for these main reduction gears, operations consisting of turning, facing and boring. Rough and semi-finish machining is combined in one cut, with finishing performed with a second cut. All operations except for undercutting and rough and finish grooving are performed with standard Carboloy tools. The three operations mentioned are handled with a high speed steel tool. Incidentally, while the part appears to be solid, it is actually in two halves.

### Cuts and Feeds Used

*Figure 9* shows the boring on a Gisholt 4L lathe of a cast steel hub for a flexible coupling. Machining operations on this part consist of: (a) turning with  $\frac{1}{4}$  in. depth of cut; (b) facing with  $\frac{1}{2}$  inch depth; and (c) boring 3 diameters with  $\frac{1}{4}$  depth of cut. The work turns at 67 rpm's, equivalent to 350 ft. per minute, at 0.015 in. feed. Finishing is carried on at 95 rpm and 0.020 in. feed. All operations except forming inside and outside radii and roughing the bore are handled with standard Carboloy tools.

*Figure 10* shows a photo of a forged steel coupling sleeve machined to a maximum runout of 0.001 in two cuts each, for turning, boring and facing. Standard Carboloy tools are used for all operations except undercutting (H.S.S.) Roughing cuts range from  $\frac{1}{8}$  to  $\frac{1}{4}$ " depth, with  $\frac{1}{16}$ " for finishing.

### Fine Finishes Obtained

To hold tolerances for dimensions and finish, only 0.005 inch feed is used for finishing the pinion shaft blank in *Figure 11*, depth of cut being .030 to .040 inches for finishing operations. Cutting speed is 280 ft. per minute for this cast steel forging. All turning, facing and grooving operations are performed with only three Carboloy 78B tool styles, there being 8 surfaces to be faced and 7 diameters to be machined.

Incidentally, since going to carbide tools, Falk Corporation has found that it could eliminate grinding on such parts as quill shafts. These are now turned with standard Carboloy tools and then merely polished.

## WHEN HEAVY LOADS CAUSE Machine Tool Chatter or Hot Bearings and Gears

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# Engineered Production



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**Fast Turning Simplified . . .** In example shown above, former time of 9.7 minutes for turning operations on tough steel impeller shafts is cut to 3 minutes by Sundstrand Automatic Lathe. Governed by easily adjusted dogs the automatic operating cycle contributes largely to this 69% increase. Machine works high-speed cutting tools to capacity . . . operator simply starts the cycle, and changes work-pieces after automatic stop.

**Quick Change-Over . . .** Sundstrand Automatic Lathe photographed was running on a lot of 200 impeller shafts. Changing

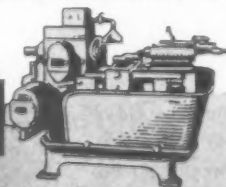
over to production on any of more than 50 other parts turned on this machine takes only 20 to 25 minutes.

**Savings . . .** Equally effective on long and short runs, Sundstrand Automatic Lathes save on initial investment, set-up time, running time, operating skill and energy. They speed production on present requirements, have large potential value for future commercial manufacturing.

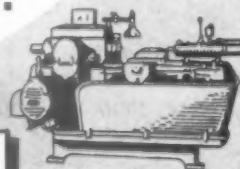
**Use This Service . . .** Save time and money. Let Sundstrand Engineered Production Department suggest most effective applications of Automatic Lathes for your turning . . . and Rigidmils for your milling. Plan now for future deliveries.

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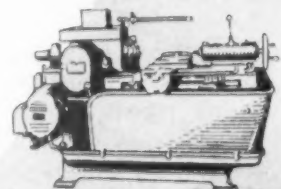
Model 8  
Automatic  
Stub Lathe



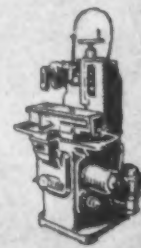
Model 10  
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In their respective fields, Sundstrand machine tools are unexcelled for high production, accuracy, and lasting value. Write for complete details.

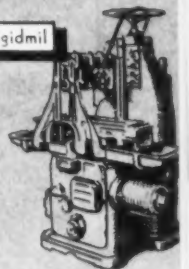


No. 00 Rigidmil



No. 0 Rigidmil

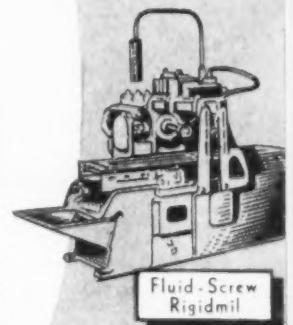
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# RIGIDMILS · STUB LATHES

Hydraulic Operating Equipment — Drilling and Centering Machines

# To the Men Who Work Here

I am writing this letter as a personal thought of my own and what I am asking you to do is not based on any mercenary attempt of a company trying to high-pressure its employees into doing something for the company's benefit and gain.

I ask that you read this letter very slowly and let the full thought and meaning of each sentence be clearly understood and retained.

This country is engaged in a war that covers the entire world. I don't really believe that any of us realize the seriousness of the situation we are in or the cleverness of our opponents. Our company is engaged in the manufacture of vitally important defense material. I feel that we are fortunate in being able to contribute so directly to the needs of our country.

All of us who are employed in an executive capacity have come to realize more and more what a shortage of everything there is. We are short of time to do all the things that are needed. We are short of trained manpower—you know this as well as I do. We are short of material such as iron, steel, brass, aluminum, rubber and synthetics—all of them vital to our production. We are short of machine tools; and small tools such as taps, drills, reamers, tool bits, emery cloth; also supplies such as rags, oil, and paper of all kinds.

All of this leads up to my request, which I am sure you will not misunderstand for criticism of yourselves or grandstand patriotism on my part. Let's go back over the things which I mentioned in the preceding paragraph and see what we can do about saving more of them.

First, time is something that we waste in any number of ways. If each one of us could save just a few minutes each day and apply them toward our output, the result would be more output and better deliveries—we could do this with our present manpower and equipment. We all have a tendency to lose a few precious minutes because it's near quitting time or lunch time and we don't think we could get that last cut through or maybe we haven't got time to get a tool—or some other reason. Some of us do too much visiting—this loses time for both ourselves and the other fel-

low. Let's try to make every second count.

Second—about manpower. A lot of us in here are on new jobs and doing things to which we are not accustomed. Some of us with more experience will notice a man doing a thing wrong—it may be his tool, his machine speed or the feed, maybe he is looking for something. A lot of us take the attitude that it's none of our business, but think what a few minutes saved here and there will add up to in offsetting the lack of manpower and time that we are fighting for. This applies to the office and drafting room and storeroom as well as to the shop. If our supervisors recommend a better or quicker way to do something, let's not resent it but accept the suggestion as a friendly one.

It's going to be necessary for all of us to endure some hardships and inconvenience because of this war—overtime, night shifts and broken hours are some of them—but if our manpower is going to be used to the best advantage we will all have to co-operate.

About material—I know and you know that we could make a lot of things we use last a little longer if we really set out to do it. Before the war we might have argued that if we had to pay for these things ourselves we'd be more careful of them, but now it's not a question of money—it's a question of being able to obtain them at all. Let's see that material is used to full advantage; that it is not *spoiled* through carelessness; that it is returned to storage so that we can find it and do not have to waste precious time looking for it.

Machine tools are the heart of our plant. Without them we are helpless. To replace one would take from 6 months to over a year. We can't take too good care of them—they must be oiled and serviced—if something needs adjusting, don't let it ride for it may develop into a serious delay. These machines must be kept running and working to their full capacity and they are just as important as any piece of fighting equipment.

Small tools are at a premium today. Everyone we break or lose is a score for our enemy. Use the proper speed and feeds, use coolant when required, don't throw them around where some-

thing may fall on them or injure the cutting edge. High speed bits are getting scarcer every day. Bits containing tungsten, which comes from China, are now sold on the basis of one pound of tungsten bits to three pounds of molybdenum bits and it may get worse. Don't uselessly hoard bits, we need them too badly.

I know we can do better when it comes to conserving shop supplies. Also, by conserving this kind of material, we indirectly save time which is all important.

While you are reading these lines some of our soldiers and sailors are giving their lives for our future security. Please just stop for a moment and really think what that sentence means—young fellows in our army and navy (soon they'll be more than that to us, they'll be fellows we know) full of health and with everything to live for giving their lives. Yet we question working conditions and working hours. Can we ever repay our debt to them? I don't think we can, but we could try. If you could witness their violent deaths you would never forget it but the war is thousands of miles away and until these deaths begin to touch us personally it is hard for us to realize that they are taking place. Just as sure as our soldiers and sailors have a definite opponent, we have ours. Let's assume that we could travel across the ocean into the Japanese empire. We would find a small business just like our own making the same type of equipment that we are making. Furthermore, they would be producing it on American machine tools, in all probability the same make and size as ours. Suppose we could bring the place next door to ours—what an incentive that would be! Could we outproduce them man for man, machine for machine? I'm sure we could but until we see it that way I'm not sure that we can get down to brass tacks. That plant is our opponent just as sure as the fighting forces of that country are the opponents of our fighting forces.

In conclusion, let me say that our plant is a really vital part of the national defense, so don't discuss our products, our equipment, our hours of work with anyone outside.

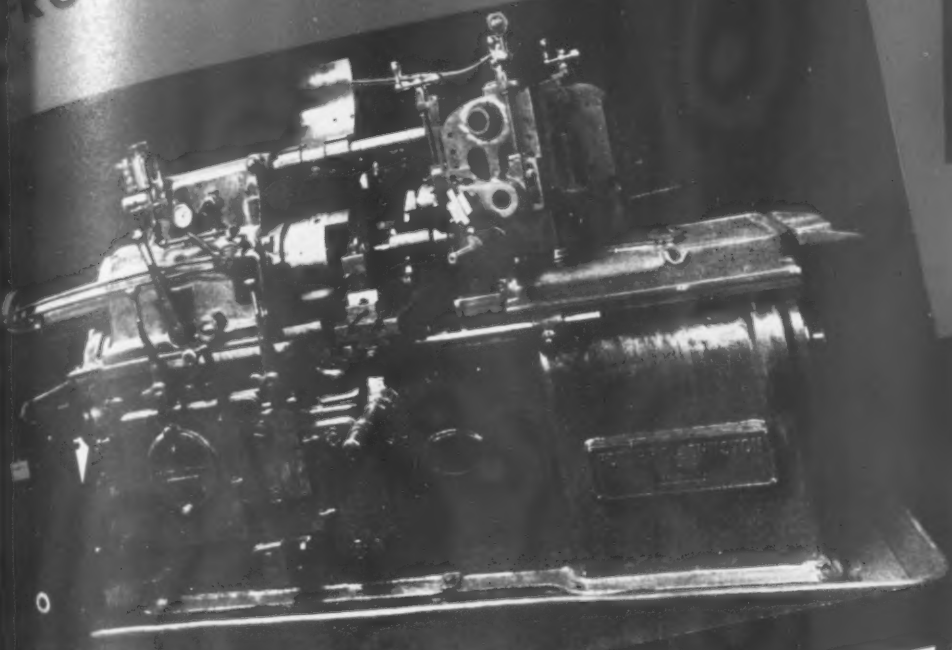
By the Manager

**NOTE:** *Perhaps you too have some employer problems? Here is how the manager of one corporation addressed his men.*

# \*Results

FROM PLANNED PRODUCTION ON A

**4-D  
POWERFLEX**



**\* A BEARING CAGE EVERY 3.27 MINUTES ...**

As in the larger P&J Automatic Chucking and Turning Machines, the design of the smaller 4-D Automatic has been developed to insure the extreme rigidity required to make use of present day cutting materials effectively.

The P&J 4-D Machine shown here has been equipped by P&J Tool Engineers to produce bearing cages to extremely close tolerances. The turning stem tool holders carry a hardened and ground steel bushing, to receive the overhead pilot bar, in this case have adjustable blocks which cover a wide range of sizes, through the medium of a ball handle screw adjustment.

Of particular interest to production men is the fact that this form of construction can be used as a basis for the design of tools for P&J automatics whenever it is desirable to provide for a quick set-up from one size part to a similar one slightly larger.

Features of the P&J 4-D Automatic include: automatic speed and feed changes which assure maximum output; hardened and ground steel ways on machine bed and turret slide; automatic binding of turret after indexing; spindle mounted on Timken tapered roller bearings; an overhead pilot of extreme effectiveness.

## DETAILS OF JOB AND PRODUCTION

Part: Bearing Cage  
Material: Malleable Iron  
Machine: 4-D Automatic  
Machining Time: One Operation only, 3.02 minutes  
Floor to Floor Time: 3.27 minutes  
Production per 51 min. hour: 15.6 bearing cages  
Machining Operations:  
1st T.P.: Rough bore 3.78" dia.; rough bore 4.331" dia.; bore 4 23/64" dia. (on cut only); Rough face flange; rough turn 4.871"-4.998" dia.  
2nd T.P.: Finish above cuts except as noted  
3rd T.P.: Blank  
4th T.P.: Bore 4.331" dia.  
5th T.P.: Slide turn 4.871"-4.998" dia.

# POTTER & JOHNSTON MACHINE CO.

PAWTUCKET

RHODE ISLAND



Theory of metal cutting explained and how application of proper cutting fluids raises production on the new tough alloys.

# Lubrication

## Applied to Metal Cutting

By **W. H. OLDACRE**  
D. A. Stuart Oil Co., Ltd.  
Chicago, Illinois

**L**UBRICATION as an art is older than history. Wheels turned on axles and slides moved on ways long before recorded history began, and when they moved, unquestionably some form of lubrication eased their motion. Nevertheless, lubrication has been taken so much for granted and universally used with so little questioning that all our experience and all the resources of modern science fail as yet to accurately define the subject.

### Lubricants to Reduce Friction

There is always resistance to movement between contacting surfaces; the amount of resistance varies with pressure, speed, and the physical and chemical relationship of the surfaces. In overcoming this resistance, friction is developed and heat generated. Losses are thus incurred which must be minimized if machines are to operate properly. Thus, pressure and speed are limited by size and design. Bearing surfaces are made smooth and bearing materials selected to give the best chemical or metallurgical relationship. Finally, a "lubricant" is introduced. It may be a liquid, solid or gaseous material. It may, and obviously does, modify any or all of the above mentioned functions. Pressure may be equalized or distributed through the lubricating medium, speed effects may be modified through a multi-layer phenomenon, surface irregularities may be minimized by a filling in or separating action, and new chemical relationships may be introduced by the chemical activities of the lubricant. The primary objective is to improve or maintain the relative mobility of the bearing surfaces and, in fact, a lubricant may be defined as "any substance which, between bearing surfaces, helps to maintain or improve their relative mobility . . ." However, this subject of lubrication cannot but be confused by any at-

tempt at over-simplification. It is a complex subject and should always be treated as such.

Much has been learned in the last ten or fifteen years through the study of automotive lubricants. Reduced size of parts, increased power and speed, increased demands for smoothness, noiselessness and reliability have presented increasingly difficult problems to the automotive lubricant en-

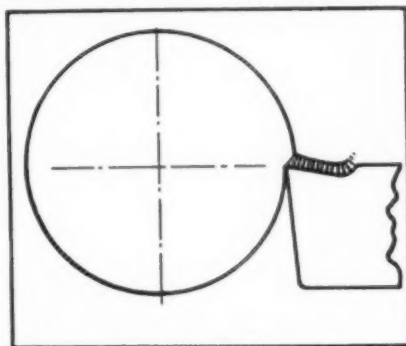


Figure 1  
Theory of chip formation.

gineer. To solve these problems new test machines and test methods have been developed, and as a result new light has been thrown on the general problem.

### Additives Change Lubricating Qualities

As a result sulphur in a lubricant is today recognized as an anti-weld agent. That is, it prevents or limits welding between heavily loaded bearing surfaces. Chlorine, phosphorous, fatty acids and many other materials and compounds are known to reduce friction through "oiliness" or "lubricity" effects. In addition, we have chemical additives to modify practically every characteristic of oils used as lubricants, and the so-called additive industry is growing with great rapidity. Additives are available to increase load carrying capacity, increase oiliness, increase stability, lower pour point, raise viscosity in-

dex, increase detergency, and increase stringiness.

The Tool Engineer and designer should be the first to recognize the adaptability and usefulness of the lubricants made possible by these developments. Lubrication should never be an afterthought. It is as much a part of basic engineering and design as are the materials and dimensions. It is no stretch of the imagination when we suggest that lubricant specifications should appear on the original blueprints.

### Problems of Cutting Oils

During the early history of metal cutting, few, if any, cutting fluid problems are encountered. Prior to the introduction of refined petroleum oils in the middle of the last century, fatty oils were commonly used for spindle and machine oils, and they also functioned well as cutting fluids. Due to their stability and low cost, refined petroleum rapidly replaced fats for machine lubrication, but for reasons which, until recently were not clearly understood, the petroleum could not replace the fatty oils for cutting fluid applications.

In the machining of metals, material is removed by the action of an edged tool bearing against and moving in respect to the work-piece. The metal removed usually forms a chip. Much difference of opinion exists regarding the mechanism of chip formation and the work-tool relationship.

### Investigation of Cutting Tool Action

Early investigators assumed that the chip split off ahead of the cutting edge with the curling chip bearing on the top rake of the tool and generating and maintaining the splitting action (Fig. 1). This explained the cratering frequently observed on the top rake, and also the formation of a built-up edge by an accumulation of debris on the tool edge.



# O P M

## asks co-operation

**W**E are at war—and the O.P.M. has set up definite rules which we and our customers are asked to observe. Manufacturers of hack saw blades are restricted in their purchases of High Speed steel (18-4-1) in the ratio of 1 High Speed to 3 of Molybdenum type H.S.

This means that those who have been in the habit of buying our Red Arrow High Speed power blades must, of necessity, expect limited quantities. There simply is not enough to go around. It also means that Red Arrow hand blades will be available in Molybdenum type only — *and it's a mighty fine cutting tool.*

Further, it means that users of

High Speed power blades must satisfy a portion of their demands with a power blade that is of equal quality.

*And this can be done!*

It can be done and it gives us a chance to repeat what we have said many times in the past: *That for all around production work there is no better blade than Barnes Molybdenum SERVICE.*

Made in hand and power sizes, the performance of these blades has won thousands of friends — and before this emergency is over, it will win many more.

Remember the name — Barnes SERVICE Molybdenum.

*Sold throughout the United States by industrial distributors whose service to industry we respect and value. Through them you can buy Barnes SERVICE Blades today. A trial will convince you of their outstanding quality.*



*"Keep them rolling, keep them flying, keep Democracy from dying"*

—USED BY PERMISSION OF PEARSON AND ALLEN, WASHINGTON MERRY-GO-ROUND

Later investigators failed to find evidence of the split ahead of the tool, denied its existence, but claimed the built-up edge actually acts as the working edge of the tool. Herbert and others pointed out the work hardened characteristics of the built-up edge and explained its functioning on that basis. Klopstoeck designed tools ground to built-up edge contours.

During the last four or five years high - speed micro - photography and other means of accurate observation

have added much to our knowledge of the metal cutting process. The work of Hans Ernst and his associates at the Cincinnati Milling Machine Co. has been especially productive.

#### Cutting Fluids Reduce Friction

As a result of his investigations, Ernst concludes that the chip is formed by plastic flow occurring in the work-piece along lines roughly normal to the top rake of the tool. He observes that it is possible to cut me-

tal without the formation of a built-up-edge (contradicting the findings of most of the earlier investigators) and explains the formation of the built-up edge on the basis of secondary lines of shear developed by the friction of the chip on the tool face. He decides that the best finish will be produced where no built-up edge exists and advocates the use of better cutting fluids to reduce the friction between chip and tool, thus reducing the size of the built-up-edge with resulting improvement in finish.

From a careful inspection and analysis of chip and built-up-edge microphotographs can be drawn certain well defined conclusions, i.e., in the case of the more elastic materials the chip consists of flattened segments from the work-piece, the dividing lines between the segments lie at right angles to the face of the tool forming the chip. The segments are frequently bent toward the tool edge on the tool side of the chip. The built-up-edge appears to be composed of segments lying roughly parallel to the tool face. In some cases the structure appears to be continuous between the bent ends of the chip segments and the segments of the built-up-edge. Such a structure is inconsistent with Ernst's theory of built-up-edge formation and with all other theories so far advanced.

#### Theory of Chip Formation

However, such a structure can easily be explained. Assume that at the start of chip formation the surface of the work-piece is roughly normal to the face of the tool and at the tool edge. As the tool moves forward the edge will indent the metal. (Keep in mind the fact that steel is considered perfectly elastic up to its yield point). This indentation compresses the underlying metal, thus developing pressure toward the surface. Thus is formed a surface segment under tensile stress and with the stress tending to concentrate at the tool edge. This segment will bulge upward and toward the tool face to an extent determined by the metallurgical characteristics of the work-piece. If the metal is stiff, a tensile failure will occur at the tool edge before the bulge becomes too great. However, if the metal is ductile the bulge will progress until the surface of the segment contacts the tool face. The friction between these two surfaces will limit the movement of that part of the chip

## TANNEWITZ DI-SAWS

*Do in MINUTES jobs which otherwise require HOURS!*



Conservatively estimated TANNEWITZ DI-SAWS save an average of 70% of the time and cost involved in making inside and outside cuts on dies, shoes, templates and the hundreds of other operations, including filing and polishing, to which these machines are ideally adaptable. In many instances they are turning out work in as little as ONE-TENTH of the former time required.

To expedite production and cut costs, by all means investigate the tremendous possibilities these machines offer in tool and die making and other applications.

#### SAWING SPEEDS PER MINUTE

THICK- NESS	CAST IRON	COLD ROLLED	TOOL STEEL	HI SPEED STEEL	HI CHROME HI CARBON
1/4"	16"	9"	5"	23/8"	1 1/2"
1/2"	8"	4 1/2"	2 1/2"	1 1/8"	3/4"
1"	3 1/2"	2 1/4"	1 1/4"	1/2"	3/8"
1 1/2"	2"	1"	5/8"	5/16"	3/16"
3"	1"	1/2"	5/16"	5/32"	3/32"
6"	1/2"	1/4"	5/32"	5/64"	1/32"

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*Brazing  
does it!*



**SHELL END MILLS  
CORE DRILLS  
MILLING CUTTERS  
COUNTERBORES  
WEAR STRIPS  
SPECIAL TOOLS**

For faster milling of cast iron with more pieces per grind, this new series of brazed rigid toothed cutters can be operated at surface speeds of 120 to 170 feet per minute with a chip load of .005 to .010 inch per tooth.

A tough alloy steel body provides solid support to the Stellite blades.

Stellite Wear Strips are recommended for furnishing a means of holding pilot size throughout the service life of a tool.

**LONGER LIFE — HIGHER PRODUCTION — FEWER GRINDS  
HEAT RESISTANT — RIGID CONSTRUCTION**

**SCULLY-JONES AND COMPANY**  
1901 SO. ROCKWELL ST., CHICAGO, ILLINOIS

segment with a resulting secondary failure and separation which will leave a small fragment of the segment lying parallel and adjacent to the tool face. A repetition of this process forms a built-up-edge from successive fragments. In either case the main body of the stressed surface segment pulls away from the tool, slipping in plastic flow over the surface of the underlying metal. Thus, by successive segmentation a chip which curls away from the tool edge is formed.

#### Action of Cutting Fluid

Such a hypothesis explains the observed metallurgical structure of the chip and built-up-edge. It also allows a simple answer to other puzzling questions. "How does the cutting fluid act on the edge of the tool. Under this hypothesis there is nothing to interfere with it, in fact, the action of the segments actually draw it in. How does a coolant function? — By keeping the metal in the chip and work-piece cooler and thus *stiffer*.

What function does sulphur in a cutting oil perform? It prevents the welding of chip metal, generally at the point of secondary separation to the tool and the consequent cratering of the tool.

From the above it can be deduced that an ideal cutting fluid would be an anti-weld agent — lubricant and coolant combined. In the case of the tougher and softer metal the anti-weld function is most important, while with the harder, more brittle metals the need for cooling and lubrication may predominate.

#### Tougher Alloys Require Special Fluids

The widespread use of the tougher alloys in modern metal working industry explains the almost universal use of sulphurized oils. As noted in the beginning of this paper, early cutting fluids were composed almost entirely of fatty oils. However, during the World War I fatty oil prices were high and the high speed machining of tough alloys demanded better cutting fluids. Sulphurized oils met this demand.

Today we have a large number of sulphurized oils of more or less merit available. In some the sulphur is combined with fats, in others with petroleum. In recent years there has been some use of pure synthetic compounds containing sulphur. The activity of the sulphur compounds will, to a great extent, determine the performance of the cutting fluid. It is obviously absurd to pay for inert sulphur compounds in cutting fluids.

#### "Cutting Fluids Are Tools"

As mentioned above, coolants function by keeping the metal in the chip and work-piece cooler, and therefore stiffer and easier to machine. The most widely used coolants are soluble oils. These are emulsions of different oils in water. They combine marked cooling effects with limited lubrication. Above the boiling point of water most emulsions are poor coolants, hence we can safely conclude that they do not function as such at the point of contact between the chip and tool which is usually much above this temperature.

Careful investigation and observation of cutting fluids is just as profitable as of cutting tools for cutting fluids are really tools—tools that require experienced and skilled handling to produce the highest efficiency.

THE TOOL ENGINEER



Pinion Gear

IT'S MADE OUT OF  
**SPEED CASE STEEL**  
A LOW CARBON OPEN HEARTH PRODUCT

—because...

It increased production 50%!	Ductility
It increased tool life 70%!	Plus
It reduced cost \$14.61 per ton of steel used.	Machinability
	(230 SFPM)
It eliminated a reaming operation.	

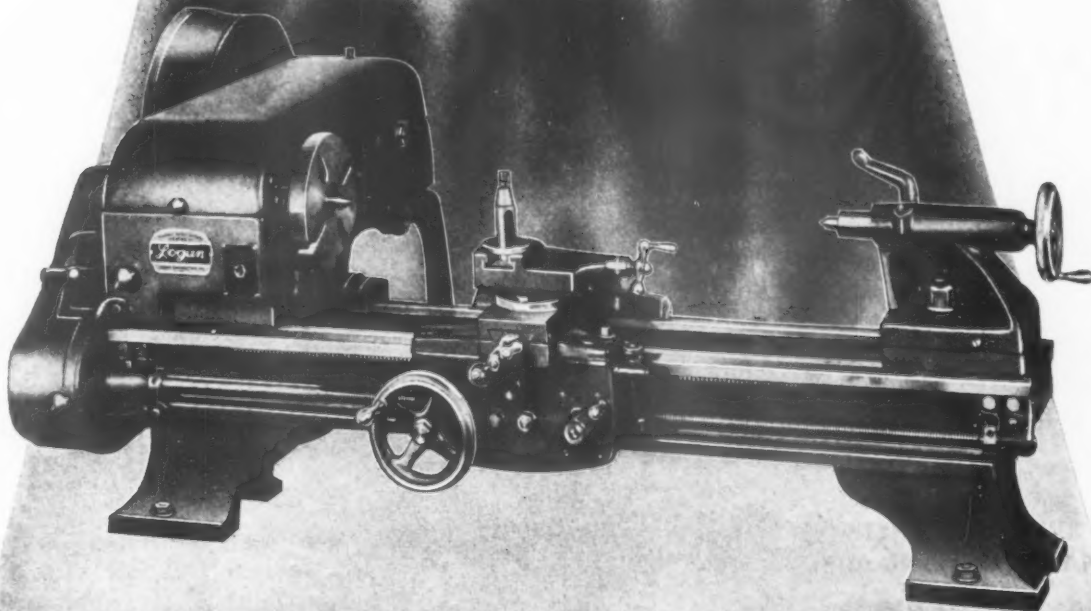
THANK YOU! To friends both old and new... thanks for your patience.  
We are doing our very best for Defense... and also for you.

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MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

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*No. 210 Logan Bench Model Back Geared Screw Cutting Lathe  
Also furnished in Floor Model, No. 200*

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A NAME TO REMEMBER WHEN YOU THINK OF LATHES

Advanced design, sound engineering, expert workmanship and rigid inspections combine to make the Logan Lathe the fine machine that it is . . . The use of ball bearings in the headstock, the patented countershaft assembly with its three-point suspension, rubber mountings and streamlined design are typical of Logan's high standards and forward thinking.

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10" swing; 24" between centers ★ Bed 6 15/16" wide by 43 1/8" long ★ Prismatic V and flat ways, hand scraped and honed ★ New Department precision pre-loaded

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COMPANY  
CHICAGO, ILLINOIS**

ball bearing headstock spindle  
★ Thread cutting, 4-216 per inch ★ 25/32" hole through spindle, 1/2" collet capacity  
★ 12 spindle speeds, 30 to 1450 revolutions per min.



How special threading dies can be quickly made — how curved holes are drilled — how aluminum superchargers are "tooled up" is explained in this interesting story

# Applied Tool Engineering

## Three interesting applications

By OSCAR W. BERG  
ERNST KRIPPENDORF  
W. D. RODRICK

Three Practical Tool Engineers  
Boston, Mass.

### SMALL OUTSIDE DIAMETER SECTIONAL THREADING DIE

Presented before the Boston Chapter  
A.S.T.E.

By OSCAR W. BERG

A special die had to be developed for threading the valve body shown in Fig. 1, because the large flange was only  $\frac{7}{8}$  inch from the outside diameter of the threaded portions. An ordinary die holder could not be used. So this special die head, and the special chasers were designed.



Figure 1

Valve body which required a new threading die due to lack of sufficient clearance between flange and body to permit use of standard die head.



Figure 2

Details of the finished die holders showing the chasers held in place by flattened taper pins and the sleeve.

The complete die head assembly is shown in Fig. 2. This consists of a slotted holder body with a steel sleeve pressed on over it to close the outside ends of the slots. These slots form retaining pockets for the chasers.

Adjusting the chasers and assembling them correctly was a problem. It was solved by making a special grinding fixture, Fig. 3. A stand-

ard set of Geometric Chasers were cut about in half with a rubber wheel. Examine the grinding fixture illustration and you will observe that the cut off chasers project about  $\frac{1}{32}$  inch. A threaded plug locates the chasers correctly in the holder. The thread is exactly the same size as the finished thread on the valve body so the chasers are held in working position. Four



Figure 3

Special holder used for grinding the outside of the Geometric chasers. It shows the dummy threaded plug inside the chasers and the clamps with which chasers are held in place.

*we must not forget . . .*

### *Lincoln's Gettysburg Address*

Fourscore and seven years ago our fathers brought forth on this continent a new nation, conceived in Liberty, and dedicated to the proposition that all men are created equal.

Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battle-field of that war. We have come to dedicate a portion of that field, as a final resting-place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this.

But, in a larger sense, we cannot dedicate—we cannot consecrate—we cannot hallow—this ground. The brave men, living and dead, who struggled here, have consecrated it far above our poor power to add or detract. The world will little note nor long remember what we say here, but it can never forget what they did here. It is for us, the living, rather, to be here dedicated to the unfinished work which they who fought here have thus far so nobly advanced. It is rather for us to be here dedicated to the great task remaining before us—that from these honored dead we take increased devotion to that cause for which they gave the last full measure of devotion; that we here highly resolve that these dead shall not have died in vain; that this nation, under God, shall have a new birth of freedom; and that government of the people, by the people, for the people, shall not perish from the earth.

Defense has first call on our production facilities for reconditioning High Speed Tools, Files, etc., Rebuilding Pneumatic Tools, and Hard Chrome Plating Dies, Machine Parts, etc.

Since 1939 due to the increased demand upon us we have increased our production capacity four fold.

WE ARE PREPARED and stand ready to meet all threats to our freedom and to aid in the freedom of 130 million individuals who have not forgotten Lincoln's Gettysburg Address.



EASTERN CUTTER SALVAGE CORPORATION, 30-32 LITTLETON AVE., NEWARK, N. J.

Western Plant MASTER TOOL CO., INC., 5605 HERMAN AVE., N. W. CLEVELAND, OHIO

Chrome Plant MASTER CHROME SERVICE, INC., 5709 HERMAN AVE., N. W., CLEVELAND, OHIO

semi-circular clamps held by filister head screws keep the chasers firmly against the dummy thread of the plug. The chasers have a groove ground in their backs to take this clamp. Then the holder completely assembled is ready for rotary grinding. Fig. 3. shows it before grinding.

The method of holding the chasers in the die body with flattened taper pins, is shown in Fig. 2. The set of Geometric chasers required in this special head can be cut off, slotted and ground in about two or three hours.

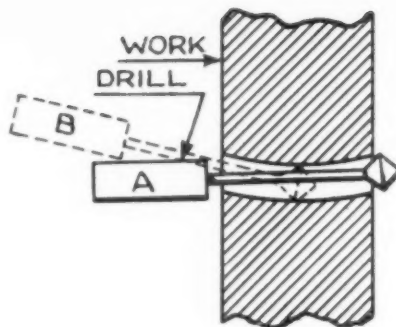


Figure 5  
This shows how the drill can be passed through a curved hole.

## DRILLING A CURVED HOLE

Presented before the Boston Chapter  
A.S.T.E.

By ERNST KRIPPENDORF

Asst. Tool Supervisor  
United Shoe Machinery Corp.

In shoe machinery manufacture there is a need for a curved needle for certain stitching operations such as sewing the sole to the shoe upper. This needle has to be accurately supported as it runs in and out of the leather. This is the part in which we are interested. It is called the needle guide. As the needle is curved, a curved hole must be drilled in the needle guide. These holes vary in diameter from a No. 35 drill to a No. 56 drill, or in other words, from 0.110" to 0.0465". The radius of the curvature of the needle and hole is one inch. These holes are drilled in guides up to one-half inch in thickness.

The drill used is a two lip, high speed steel, flat fluted tool with a reduced shank which runs close up to the cutting lips. (See Figure 5)

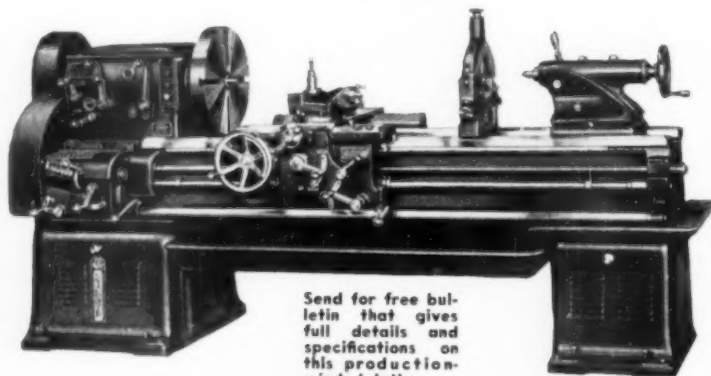
From the sketch you can see how it is possible with this special tool to drill a curved path through the material. The drills are run between 3800 and 4000 rpm. A sperm oil coolant is used. The method of directing the drill in the work is shown in Figure 6.

These pieces are drilled in a special machine which feeds the work to the drills. The work is swiveled on a one inch radius and the drills are run in fixed quills. Work one-half inch thick is drilled from both sides, Fig. 6, thinner work, up to 9/32", can be drilled all the way through with one drill, Fig. 5. On some of the thinner jobs the hole is drilled from one end and reamed with a ball type reamer from the other. This gives a very smooth, glassy surface. Some parts are drilled with a mechanically operated, intermittent feed, (i.e. drill and release, drill and release), and some are finished with a hand feed.

Material drilled is nitroloy or high nickel steel. Tool life under good conditions extends upward to 1500 pieces. More drills are rendered useless because of springing of the shank than by reason of breakage. When the shank springs, an error in the curva-

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**THE BRADFORD MACHINE TOOL CO.**

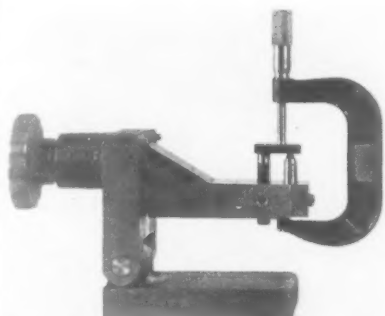
CINCINNATI, OHIO

PRECISION TOOLS SINCE 1840

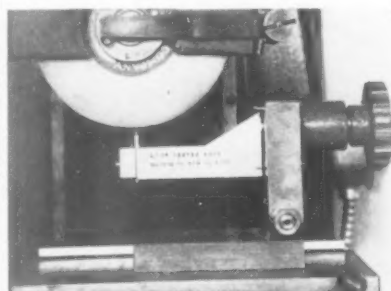


# New C-66 RADIUS DRESSER for SURFACE GRINDERS

A low-priced, rugged attachment for any make of surface grinder. Mounts directly on magnetic chuck. Dresses wheel without dismantling machine—a one hour job in 10 minutes!

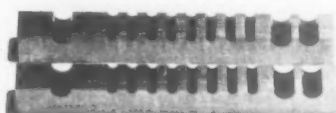


The diamond is set by simply measuring with micrometer from top of hood to bottom of arm.

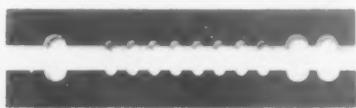


The C-66 will accurately dress wheels to both male and female radii operations. Is open and easy to see. Avoids necessity of removing guard since wheel is dressed from below.

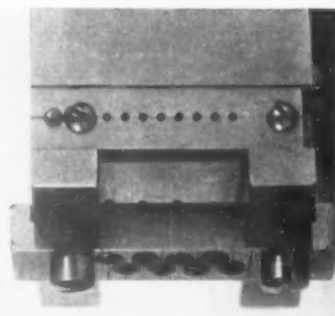
**NOTE** how our Radius Dresser and two High Speed Tool Bits replace an expensive Jig Boring Machine. Drill jig made with two high speed tool bits ground together on surface grinder, eight .062 holes, two screw holes, one dowel pin-hole. No drill bushings, no lapping, no hardening. Grinding time two hours fifteen minutes. Simple, Easy, Quick.



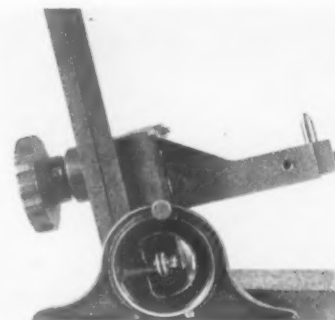
Two High Speed Tool Bits ground for drill jig.



Drill Jig ready to assemble.



Drill jig completely assembled.



For dressing wheels for grinding turning tools, the dresser is set at angle equal to clearance angle of tools. The C-66 is the only radius dresser with this feature.



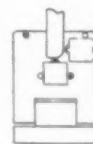
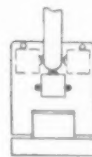
.013 Male and Female Radius.



.500 Male and Female Radius.



Long Wearing Chisel Point Diamond.



180° and 90° Male Dressing.

Prompt delivery from factory in Newark. Sold on 10 day trial. Price, without diamond, \$72.50; 1/4K diamond, \$5.00.



The diamond holder is held against a ground vee in the arm. By means of this construction any size diamond up to 1/8" can be held accurately in line with the vertical center line of spindle.

## SCHULTZ & ANDERSON CO.

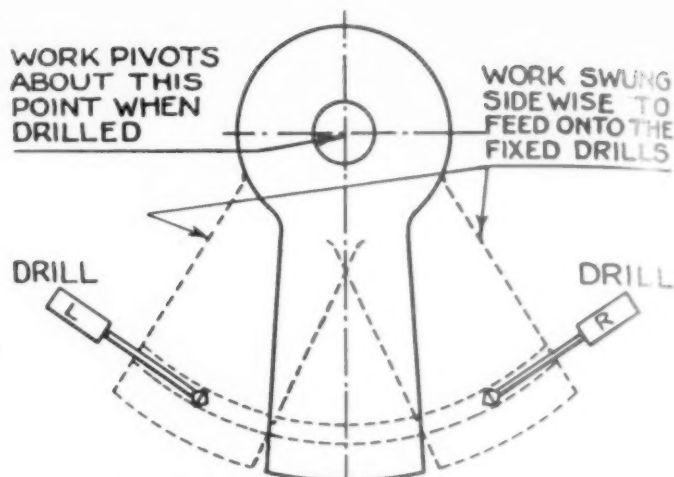
MACHINE TOOLS

176A FERRY ST.

NEWARK, N. J.

ture of the hole results. The limit requirements are plus 0.0015" minus 0.000" on the diameter of the hole and the radius must be such that a gauge with basic diameter and accurate radius will run smoothly through the hole.

**Figure 6**  
This shows how the drills are placed when drilling must be done from each side and also how the work is pivoted and fed against the rigidly mounted drills.



## We Know How Much You Need Davis Boring Tools

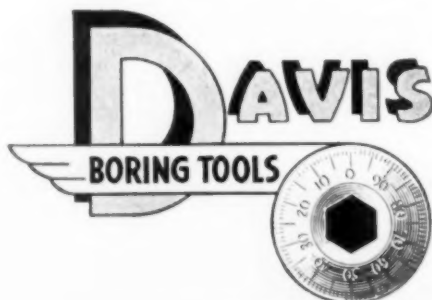
We want to sincerely thank all you Davis Boring Tool customers for the *patience* you have shown us in this national emergency.

You have known that while our production has been stepped up until it is *double* that of a year ago, most of it is still necessarily on vital Defense work—and yet you have watched your own delivery delays with a spirit of understanding and cooperation that is typically American.

We are keenly aware of your civilian needs for Davis Boring Tools. And we want you to feel that we are doing everything humanly possible to get these tools to you. Thanks again for your patience and cooperation.

### DAVIS BORING TOOL DIVISION

Larkin Packer Co., Inc. • St. Louis, U. S. A.



### THE EVOLUTION OF A FACE MILL CUTTER

Presented before the Boston Chapter  
A.S.T.E.

By W. D. RODRICK  
Supercharger Department  
General Electric Company

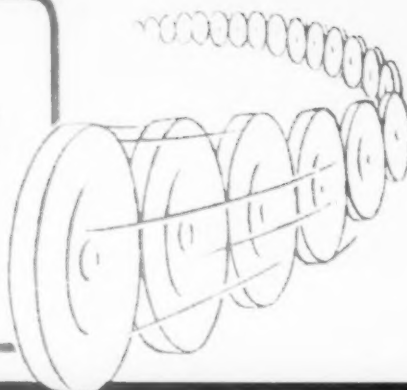
The problem confronting me was not an easy one. It was face milling of a flange on an aluminum casing about two and one-half feet in diameter. The casing consisted of two halves bolted together. The flange was to be face milled on the periphery. Its dimensions were approximately 6" x 7" length, 3/4" face and about 1/4" thickness. It was only supported on its inner side by a thin wall where it was attached to the casing body. This flange had to be machined flat to within .001" and stay flat after machining. Also it had to have a finish that would make an air tight joint.

When such a job is handled in the tool room or in small lot production the ultimate perfect product is the first objective. Time is not a serious factor. The job resolves itself into taking a number of fine cuts at slow feed and speed until the desired finish is effected. The tool cost per piece is not seriously considered.

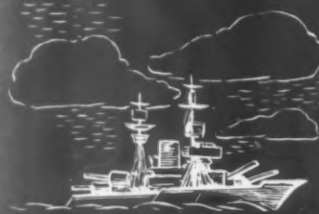
It's an entirely different problem on a high production line. Here floor to floor time becomes paramount. Woe be it to the tool man who interferes with the maximum productivity of each and every machine. His job is to furnish the best tools obtainable and set them to work under the most ideal conditions obtainable. This serves the dual purpose of getting the maximum production at the lowest possible tool cost.



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GRINDING WHEELS  
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**"SAFETY" GRINDING WHEELS ASSURE FASTER WORK AND IMMEDIATE DELIVERY!**



### NEW GRINDING PROBLEMS

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### NEEDED COMPETENT ADVICE

"Our nearby 'Safety' Grinding Wheel Sales Engineer helped us solve our problems by showing us how to convert present equipment to new demands, and by specifying the proper 'Safety' Wheel for each new task. When production . . .

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**SAFETY GRINDING WHEELS** are your answer to obtaining the "right wheels when and where you want them."

"Safety" now has nine major distributing centers where "Safety" stock wheels are stored on warehouse shelves . . . and twelve sales offices in key defense centers where you can contact a "Safety" Sales engineer to help you with your immediate grinding problems.

Our plant has been recently modernized and re-equipped, enabling "Safety" to fill your requirements promptly.

**9 SUPPLY OUTPOSTS  
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The principal object of the study under discussion was to obtain a reduction in tool cost per casing without reducing the productivity of the milling machine. As was to be expected, with improved tools, the output increased nearly 100%.

The original tool set up consisted of a conventional 12" face milling cutter equipped with twenty-six high speed steel blades. It operated at 500 rpm with a feed of  $5\frac{1}{2}$ " per minute. Ten pieces were obtained per grind.

The tool cost per piece figured 46.7 cents. Warpage was encountered after the flange cooled off. To correct this was the problem.

In correcting this trouble the first step was to remove every other blade from the 12" milling cutter leaving thirteen blades. The speed was reduced to 346 rpm and the feed doubled or increased to 11" per minute. The reduced number of blades and the slower speed lowered the cutting pressure on the work. The work remained

cooler and the warpage was eliminated. The finish which had been sacrificed by the increased feed was easily made acceptable by swabbing the flange with a sulphur base cutting oil before milling. The pieces per grind increased from ten to forty lowering the tool cost 82% or to 8.3 cents per piece, a net reduction of 38.4 cents.

This was the best that could be obtained using the cutter on hand and could well have concluded the story. There was, however, one thing that irritated. The constant removal and replacing of the heavy milling cutter was not an easy task, and no matter how carefully ground never ran quite true, thus cutting heavy on some teeth and tending to produce a slightly rippled surface under some conditions.

It seemed desirable to have a cutter body that could be left on the machine at all times and the blades changed as required. If tungsten carbide tipped blades could be used, then the blades would have to be changed less frequently and a resultant economy would be realized.

So a new holder was made, about 14" in diameter. It had twelve holes pointing outward at an angle of about  $45^\circ$  to accommodate the cutters. Two sets of cutters were made having carbide cutting tips. They had set screws with lock nuts on the rear. The blades were all ground exactly alike and set to the same length by use of the set screws. At the bottom of each hole in the holder was another set screw which could be set, locked and sealed once its correct position was found. The round cutters or blades were held in true position by set screws against flats on the sides. These set screws were at a slight angle to throw the cutters toward the bottom of the holes. After the first installation it was only necessary to loosen twelve set screws, remove the dull blades, and insert twelve new sharp ones.

Here is the final result. The number of pieces per grind went up to 1000 with a corresponding reduction in the tool cost per casing to 1.7 cents. This represents a reduction of over 96% in tool cost per piece compared with the original set up. Due to the use of tungsten carbide, the speed was increased lowering the chip per tooth, and producing an excellent finish with no appreciable heat.

## SAVING TIME Counts Double Today



**W**IZARD Quick-Change Chuck Outfits can save time for you by turning drill press jobs of two or twenty operations into a continuous performance. They enable the operator to change tools without stopping the spindle. WIZARD Collets hold tools rigid and centered, an exclusive McCrosky Feature. WIZARD Friction-Drive Tapping Collets permit tapping at drilling speed with safety . . . Ask for McCrosky WIZARD Bulletin 15-D.

<b>McCrosky Tool Corporation</b>		
<b>MEADVILLE PENNSYLVANIA</b>		
<b>COST CUTTING TOOLS</b>		
<b>SUPER ADJUSTABLE REAMERS</b>	<b>ADJUSTABLE BLOCK BORING BARS</b>	
<b>JACK-LOCK MILLING CUTTERS</b>	<b>SPECIAL PURPOSE TOOLS</b>	
<b>WIZARD QUICK-CHANGE CHUCKS</b>	<b>McCrosky Turret Tool Posts</b>	

# RIVETT AIMS AT PERFECTION

## In Performance

THE RIVETT HAND SCREW MACHINE reflects these objectives in production by its economy, operating convenience and precision. The value of this machine should be considered and recognized for initial and second operations on small precision work. Many jobs now produced on heavy, costlier units are more quickly set up and finished to closer limits on Rivett hand screw machines. The "critical," larger machines are thus released for more suitable work.



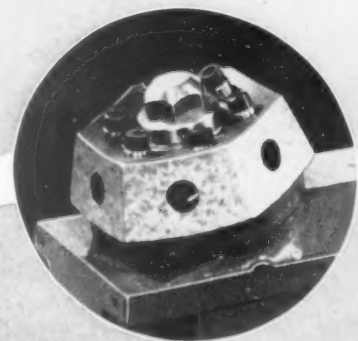
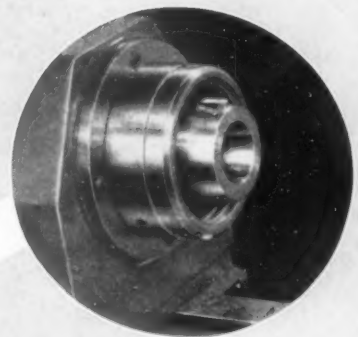
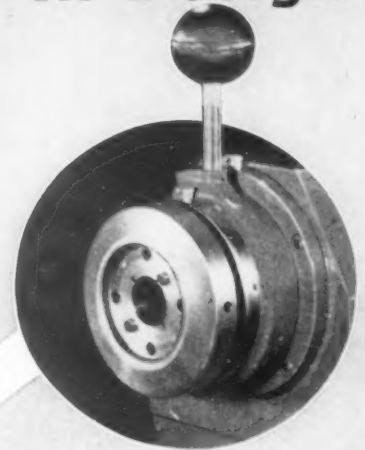
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## In Design



### RIVETT 918 HAND SCREW MACHINE

9" Swing over Bed

6" Capacity with Jaw Chucks

6" Capacity with Step Chucks

1" Capacity with Draw-in Collets  
or

1" Capacity with Push-out Collets

8 Spindle speeds 150-2500 r.p.m.

or  
8 Spindle speeds 225-3750 r.p.m.

# RIVETT

PIONEERS IN BENCH

## LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS.

LATHE DEVELOPMENT

## Handy Andy Says—



**R**ECENTLY, in connection with some defense work, I had occasion to call on one of our past presidents, a Tool Engineer who, innately modest, may prefer to remain in-

cognito. That, however, does not imply that he is unrecognized, and it is my opinion that, having a flair for getting things done, he should be stepped up from general master mechanic to a vice presidency in his company. Leaving that seed to germinate, we'll go on with the story. Our business concluded, he turned to me with an inclusive gesture: "Andy, what are we going to do with all this when the war is over? All this specialized equipment, all these huge plants?" Well, that is a poser, and personally, I can only venture an opinion based on what we've gone through try-

ing to get ready and what we may yet experience before America emerges a victor.

At the conclusion of war, I would assign one plant in each industrial center as a going arsenal, partly for maintenance of national defense but mainly for development of new ideas. For by now, a lesson bitterly learned should be deeply impressed; that eternal preparedness is not only the price of peace but a force for peace. Then, I would store such special equipment as may not be adapted to peacetime production for future needs, most of it being ultra-modern and not liable to obsolescence for a generation or more. The rest, as well as the new plants, should be diverted to peacetime manufacture, as, for example, Henry Ford proposes to build civilian planes in his Willow Run plant and as, no doubt, other industrialists have plans for the morrow.



## THE BLANCHARD TAKES IT

*as it comes!*



The Blanchard takes it as it comes—thin—thick—large—small—soft or hardened work—and gets it out.

Note the variety of work handled on the two machines shown here. This manufacturer has bought six Blanchards during the past five years.

It will pay you to put your flat surface grinding problems up to Blanchard—there is no obligation. Just write.



**THE BLANCHARD MACHINE CO.**  
64 STATE ST., CAMBRIDGE, MASS.

In mental review, I see scores of old plants that, once ideally located, are now in congested districts which, in many instances, have degenerated into slums. Adjacent streets are jammed with parked cars, while shuttling trains throw traffic into confusion. Again, many obsolete buildings, pressed into service because of the emergency, have been equipped with equally obsolete machinery. At the conclusion of war, this equipment should be junked; with the buildings, charged off to profit and loss. Both will have served their purpose and can only be counted as future liabilities, not as assets. Then, the land should revert to the city, for recreational centers and as nuclei for slum clearance.

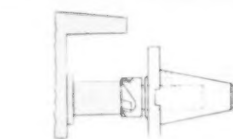
Post-war industry should be moved into the suburbs, where there is land for employee parking and for health-building recreation. Let us project a post-war America with modern working conditions, with improved standards of living and a greater mass prosperity. Above all, let us have a revival of the American community spirit, with its neighborliness and communal harmony. Let us give the lie to the canard—be it based on prejudice or propaganda—that we are surrendering control of our resources to a minority. Such things cannot happen as long as the pioneer stocks of America survive, and there is no evidence of their decadence. Change there will be, since change is the only permanent thing, and it is quite plain that we stand on the threshold of a new order. But, there is no reason why, for us, it should be materially different from the concept of the founders of this nation. We'll just streamline the proven, reliable American Way.

What I sought to bring out, in the in-

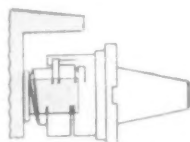
**THE TOOL ENGINEER**



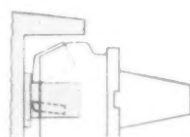
# TANK PRODUCTION PROBLEM SOLVED BY *Snyder*



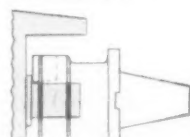
1 Face end of trunnion



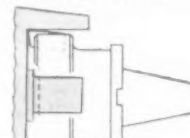
2 Rough hollow mill trunnion diameter



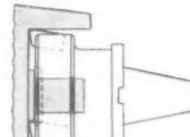
3 Finish hollow mill trunnion outside diameter



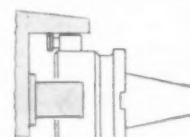
4 Finish face shoulder



5 Rough bore half-round diameter



6 Finish bore half-round diameter and hollow mill shoulder



7 Cut oil groove

8 Remove burr thrown up in grooving, re-using tool from Operation No. 6 above

## *Eight Machining Operations on Rotor Trunnions for 75-mm Gun Mounts*

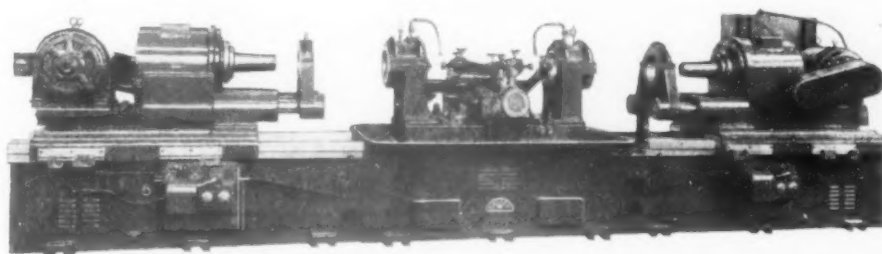
The rotor is cast armor-steel, roughly the shape of a semi-circular shield, with cross bores and trunnions at each end and an opening in the middle. It is heavy, bulky and rapidly changing in cross-section. The job is to hollow mill the trunnions, turn and face a shoulder, and bore a half-round surface below and concentric with the trunnion. Trunnions must be machined square with the cross bores, and to exceptionally close limits. Here's how Snyder engineers licked the problem:

### *The Solution:*

## **Double-End Snyder Machine . . . One Setting of the Work . . . Cutters Changed on One Spindle While Opposite Spindle is Working**

The part is located on Vee blocks, positioned and balanced for stock removal, to target gages, and secured by toe clamps and back-up screws. Tools, ground to a definite gage length, are interchangeably mounted on the spindle end faces. Brackets in front of the tool adaptors support the boring bars while cutters are being changed. Each spindle is worm-driven by a two-speed, 25 horsepower motor, controlled by push buttons both in front and in back of the machine. Coolant is supplied by an integral motor and pump, from a tank in the machine base. The overall length of the base, which is made in three sections, is 285 inches. Performance, output and accuracy—beyond expectations!

IF YOU WANT HIGH PRODUCTION AT LOW UNIT COST use Snyder's machine designing and building experience and facilities. FOR BEST RESULTS call in Snyder engineers as soon as you begin to plan new or increased production.



# **SNYDER**

**TOOL & ENGINEERING CO.**

3400 E. Lafayette Ave. • Detroit


*designers and builders of machinery  
for HIGH production at LOW unit cost*

roduction, was that while America directs every resource to winning the war, there is also concern for the future. And it is intelligent concern, intelligently inspired. What will the future hold for us when most of Europe lies prone, plunged into economic nadir as a result of an exhausting war? Well, I've given thought to that, too, as most of you have, and, in the January Tool ENGINEER, I hinted at an idea for post-war reconstruction. You'll find the essentials outlined in this issue. Naturally,

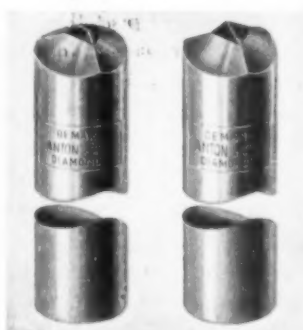
ally, there will have to be elaboration (just couldn't detail the design in the allotted space) and plenty of collaboration from you boys to put the idea across. The main consideration, however, is to take up the immediate slack at the conclusion of war; we don't want the bottom to drop out as it did in '18, when the Armistice was at once a cause for rejoicing and a prelude to depression.

Speaking for our Tool Engineers, I'm sure that the most would be glad to

pledge a part of income if, in the pledging, we can maintain employment and still have tangible return for the money spent. Besides, we provide an incentive. And you know, I think we'll win the war the quicker, and the quicker throw the enemy forces into confusion, if America provides an incentive beyond victory alone. For, in world history, many a victory has been won that left but an aftermath of bitterness for both victor and vanquished. So now, while we wage a war to a finish, let us prove that America can both take it and give it; we'll show these propagandists of a "new order" that we are going to shape it to our own design. For this war, and its ultimate winning, is but a stage in our "rendezvous with destiny"; our ultimate goal is world regeneration along a pattern that will obsolete economic wars. And, as I see it, the pioneering will have to be done by the engineers. Being a force for progress and construction, that is our responsibility.



**INDUSTRY DEMANDS MORE**  
**ASCO**  
**DIAMOND TOOLS**  
**So- WE TAKE A LARGER PLANT!**



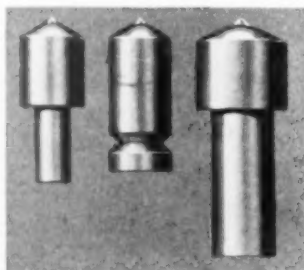
Because War Production requires full capacity from every machine 24 hours a day, more and more defense plants are calling for more and more "Asco" Diamond Tools. To meet this increased demand, we have moved to new and larger quarters at

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Telephone: COLUMBUS 5-5395

Here, greatly enlarged facilities have stepped up production and permit us to serve you better and faster on all "Asco" Diamond Tools, or to supply you with loose Bortz, Ballas and Carbons in all sizes and grades. Let us know your requirements. Send blueprints of special shaped tools for quotation. Write for detailed, illustrated folder.

Above:  
Shaped Cutting  
Tools for Turning,  
Boring, Facing.

Right:  
Lanitis Nib, Norton  
Nib, Cincinnati Nib  
for truing and  
shaping grinding  
wheels.



Dressing Tools • Wire Drawing Dies • Core Bits • Phono Points • Writing Pencils  
Valve Refacers • Impregnated Dressers • Diamond Charged Saw Blades • Glaziers' Tools

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333 WEST 52nd STREET - - - NEW YORK, N. Y.  
TELEPHONE: COLUMBUS 5-5395  
IMPORTERS OF INDUSTRIAL DIAMONDS—BORTZ, CARBONS AND BALLAS.  
MANUFACTURERS OF ALL KINDS OF DIAMOND TOOLS.

Envisioning the future, or rather a future as we would have it and can have it if we will, I am not losing sight of the tragic events of the day. But to an extent, we shaped these events simply because we ignored the handwriting on the wall; the cardinal sin of democracy was that, content to live and let live, it was blind and deaf alike to warning. Well, we are paying for remissness, and will pay, yet, the ultimate cost will be as nothing compared to the price that the enemy will pay in the final reckoning. For I've said it before, and I say it again, that Germany could have worked out her economic salvation without recourse to war, conceded provocation to the contrary. And, on the very face of it, the excuse of economic stricture collapses entirely when it is considered that, for what the war has cost, Hitler could have effected the economic independence of every being in his blood-lusted empire. Think of it!—the cost of one torpedo alone, at something like \$17,000, would pay for a worker's home, provide education for his children and provide a bulwark against old age, assuming average span of earnings. No, Hitler had his chance, as did Mussolini and Hirohito, and each blew it. For each, now, but the final last stand of desperation, then—the reckoning! *Sic gloria Transit mundi.*

Now, I'm going to ask a favor of you boys—and the ladies, too, if they'll play. When I came over, (which was about the time the new fangled horseless carriages boded a change of diet for the sparrows) one of my early teachers was

# "Perfection" IS THE PASSWORD!



**Complete Inspection HALTS Trouble Before It Begins!**  
Your production efficiency is guarded by Parker-Kalon's rigid Quality-Control of Socket Screws

Parker-Kalon's Quality-Control Laboratory makes sure that every P-K Socket Screw supplied to your assembly line is as perfect as it can be made! Separate inspection of every detail... in addition to complete analysis of strength factors... is your assurance of the 100% dependability of Parker-Kalon Socket Screw quality. "Doubtful screws" - screws that look all right but some of which fail to work right - have been eliminated by a complete step-by-step check routine which has no counterpart in the industry. The Parker-Kalon Laboratory controls the entire production of these Socket Screws - beginning with a careful analysis of the special alloy steel. Physical characteristics must surpass all working requirements. Dimensions must stay within close tolerances. "PERFECTION" is actually the password!

This protection against costly delays and rejects is ample reason why essential industries, today, specify P-K Socket Screws. Besides, they cost no more. Parker-Kalon Corp., 190-198 Varick St., New York.



**Quality-Controlled**

Complete test and inspection routine covers: Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Tension and Shear; Hardness; Head diameter, height and concentricity; Socket shape, size, depth and concentricity; Class 3 Fit Threads; Clean-starting Threads.



INSPECTION REPORT		Lab. Check
Part No. <b>A216601</b>	Date <b>11-10-41</b>	<b>OK</b>
Size <b>1/4-20 x 2"</b>	Quantity <b>2800</b>	Type <b>Socket Hd. Cap. NC</b>
Order No. <b>6551-C</b>		
<b>THREAD</b>		
P.D. (over)		
P.D. (under)	<b>21</b>	
Flat	<input checked="" type="checkbox"/>	
Torn	<input checked="" type="checkbox"/>	
Torn Lead	<input checked="" type="checkbox"/>	
Length (over)	<input checked="" type="checkbox"/>	
Length (under)	<input checked="" type="checkbox"/>	
Eccentric	<input checked="" type="checkbox"/>	
Unfinished	<input checked="" type="checkbox"/>	
<b>HEX</b>		
Diameter (over)	<input checked="" type="checkbox"/>	
Diameter (under)	<input checked="" type="checkbox"/>	
Shallow	<input checked="" type="checkbox"/>	
Too Deep	<input checked="" type="checkbox"/>	
Eccentric	<input checked="" type="checkbox"/>	
Salt in Hex	<input checked="" type="checkbox"/>	
Nicked	<b>14</b>	
Cracked	<input checked="" type="checkbox"/>	
Improper Shaving	<input checked="" type="checkbox"/>	
<b>BODY</b>		
Diameter (over)	<input checked="" type="checkbox"/>	
Diameter (under)	<input checked="" type="checkbox"/>	
Length (over)	<input checked="" type="checkbox"/>	
Length (under)	<input checked="" type="checkbox"/>	
Bent	<input checked="" type="checkbox"/>	
<b>RADIUS UNDER HEAD</b>		
Over	<input checked="" type="checkbox"/>	
Under	<input checked="" type="checkbox"/>	
<b>HEAD</b>		
Height (over)	<input checked="" type="checkbox"/>	
Height (under)	<b>4</b>	
Diameter (over)	<input checked="" type="checkbox"/>	
Diameter (under)	<b>15</b>	
Gauged Top	<input checked="" type="checkbox"/>	
Gauged Side	<input checked="" type="checkbox"/>	
Shoulder Not Square	<input checked="" type="checkbox"/>	
Nicked	<input checked="" type="checkbox"/>	
Eccentric	<input checked="" type="checkbox"/>	
Column Total	<b>40</b>	
<b>POINT</b>		
Flat	<input checked="" type="checkbox"/>	
Nicked	<input checked="" type="checkbox"/>	
Diameter (over)	<input checked="" type="checkbox"/>	
Diameter (under)	<input checked="" type="checkbox"/>	
Length (over)	<input checked="" type="checkbox"/>	
Length (under)	<input checked="" type="checkbox"/>	
Blanks	<input checked="" type="checkbox"/>	
Column Total	<b>22</b>	
Column Total (left side)	<b>40</b>	
<b>GRAND TOTAL 62</b>		

**PARKER-KALON**  
*Quality-Controlled*  
**SOCKET SCREWS**

Give the Green Light to Defense Assemblies



a winsome Irish colleen who just couldn't do enough for an immigrant boy trying to reconcile the vagaries of the English language. Maybe she didn't do so badly by me; at any rate, I owe her a great debt, as each of us is indebted to a small circle of women for our nobler inspirations and aspirations. I just heard from her, saying that she had been struck down by a car while enroute to Florida, and is now laid up at University Hospital, Augusta, Ga.

Now, I've put in a plug for more than one of you boys, and—well, *cultus pot-*

*latch*, as the Siwash Indians put it. (Meaning, one good turn deserves another). So, will you please drop the lady a card or a line of cheer? Maybe some of you folks in Nashville—being neighbors, like—will extend a bit of the famous Southern Hospitality to a bed-ridden New England schoolma'm, and perhaps a friend in Canada will send regards. She is Miss Agnes Gormley.

While you have your pen in hand, send wishes along to A. E. Francisco, 15373 Tracy, Detroit. "Frisco", who is a buddy of Bill Maier and Joe Siegel.

and a prime favorite among local Tool Engineers, is making a gallant fight for recovery after a long and serious illness. A few words of cheer will help bolster his morale. Please, now!—and thanks a lot.

▼ ▼ ▼

An open letter to Frank Curtis, Pres., and Roy T. Bramson, Chapters Ch'man.

Gentlemen:

Please arrange for a Chapter in Montreal at your very earliest convenience. We want more Canadians in the A.S.T.E.

Sincerely,

*A. E. Francisco*

▼ ▼ ▼

NEW BOOKS

*Engineering Tools and Processes* by Herman C. Hesse, Associate Professor of Engineering, Drawing, and Machine Design, University of Virginia. 627 pp. \$4.50. D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York.

A study of production technique, this book has been developed for a one-semester lecture or reading course in engineering shop processes and practices. The first three chapters offer a survey of basic materials, elements, and devices, to acquaint the student with engineering nomenclature and terminology.

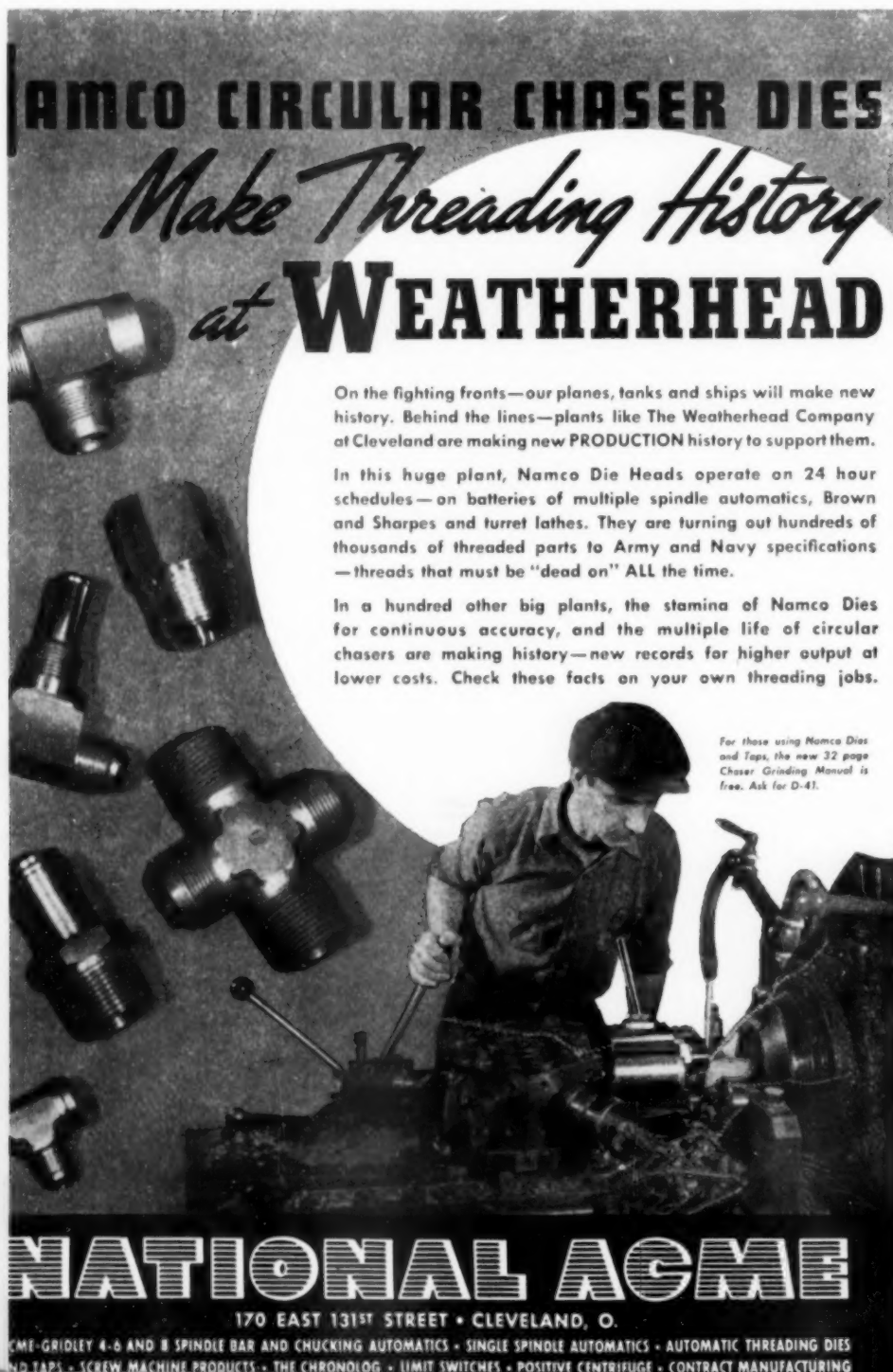
The text then takes up the usual shop techniques and machines, continues with discussions of production machinery and processes, and illustrates the application of these methods to the manufacture of specific parts.

The book concludes with a discussion of important considerations in design and the manner in which they affect production economy and feasibility. It is illustrated where possible and question and problem sections are included.

*Practical Arc Welding* by W. J. Chaffee. 516 pp., 512 illustrations, \$2 postpaid. Published by the Hobart Trade School, Inc., Troy, Ohio.

As a result of the sudden acceleration of welding activity there has been an unprecedented demand for trained welding personnel. Even experienced welders find that they must keep abreast of modern procedures and techniques at all times. For these reasons this complete handbook of practical arc welding was written.

THE TOOL ENGINEER



**NAMCO CIRCULAR CHASER DIES**

*Make Threading History*

**at WEATHERHEAD**

On the fighting fronts—our planes, tanks and ships will make new history. Behind the lines—plants like The Weatherhead Company at Cleveland are making new PRODUCTION history to support them.

In this huge plant, Namco Die Heads operate on 24 hour schedules—on batteries of multiple spindle automatics, Brown and Sharps and turret lathes. They are turning out hundreds of thousands of threaded parts to Army and Navy specifications—threads that must be "dead on" ALL the time.

In a hundred other big plants, the stamina of Namco Dies for continuous accuracy, and the multiple life of circular chasers are making history—new records for higher output at lower costs. Check these facts on your own threading jobs.

For those using Namco Dies and Taps, the new 32 page Chaser Grinding Manual is free. Ask for D-41.

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ACME-GRIDLEY 4-B AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • SCREW MACHINE PRODUCTS • THE CHRONOLOG • LIMIT SWITCHES • POSITIVE CENTRIFUGE • CONTRACT MANUFACTURING



*Van Norman*

## HAND MILL

### *...adds new utility to any Production Department*

This modern machine is an invaluable "general utility" member of the milling lineup in any production department... bringing new speed, accuracy and economy to the output of many small and medium-sized parts.

The Hand Mill is built to the highest standards of precision, with plenty of rigidity and power for maximum metal-removing capacity, and smooth operation. The

#### **SPECIFICATIONS:**

Table: 26" x 6"  
Table Longitudinal  
Adjustment: 17 1/2"  
Table Cross  
Adjustment: 7 1/2"  
Table Vertical  
Adjustment: 12 1/2"  
Cutterhead Vertical  
Movement: 6"  
6 Spindle Speeds:  
160 to 1100 rpm  
1 1/2 HP Motor Drive

heavy-duty cutter-spindle, mounted in the movable cutter-head, is driven by a 1 1/2 HP motor. This machine has the rugged strength for heavy cuts... and at the same time, has the sensitivity for smaller, lighter cuts. Every feature of the Van Norman Hand Mill is designed to assure the same high standards of performance which have been the distinguishing mark of all Van Norman Milling Machines for more than half a century. Write for bulletin.

**VAN NORMAN MACHINE TOOL COMPANY • SPRINGFIELD, MASSACHUSETTS**

# A. S. T. E. DOINGS . . . . .

By IRWIN F. HOLLAND



## Akron

The Akron Chapter held its monthly meeting at Seilers Restaurant Thursday, December 18, 1941. Dinner was served to 44 members and prospective members.

After dinner, the meeting was called to order by President, E. S. Woodhall. Four names were suggested for Chapter 47: Summit, Akron, Rubber City, and Alpha. Balloting resulted in choosing "Rubber City" as the official name of this Chapter. The President then appointed the following members of the Program and Membership Committees:

*Program Committee:* Vice President, Allen, Paul Passmore, R. L. Andrews; *Membership Committee:* E. W. Beebe, Chairman; Treasurer Dague. Mr. Beebe to choose a third member.

The president called on Mr. Passmore, who is from Detroit, Chapter No. 1, for a short talk on A.S.T.E. activities in that city.

A discussion as to invitation of guests resulted in the agreement that guests should be invited to meetings, expenses to be arranged by the Program Committee.

## Baltimore

The first 1942 meeting of the Baltimore Chapter was held at Sears-Roebuck Auditorium on January 7. Mr. F. A. Kelly of Cleveland Twist Drill Company talked on the subject, "Uses and Abuses of Twist Drills."

## Boston

The January meeting of the Boston Chapter was held on the 15th at M.I.T. The meeting was preceded by a dinner at the Walker Memorial. Over two hundred members and guests attended. Mr. Charles Hardy, President of Charles Hardy, Inc., of New York City was the speaker at the technical session. His talk on "Powder Metallurgy" was of un-

usual interest to all. He described briefly the methods of producing various types of metal powders and outlined the steps from raw materials to finished products. Mr. Hardy explained Powder Metallurgy is the art of producing metal parts and shaped objects from individual, mixed or alloyed metal powders, with or without the inclusion of non-metallic constituents, by pressing or forming objects which are simultaneously or subsequently heated to produce a coalesced, sintered, alloyed, brazed or welded mass, characterized by the absence of fusion or the fusion of a minor component only. He further explained that at first we could only produce a piece by vertical compression in mass production. Then vertical and lateral compression became possible. Further still, we are able to compress shapes with different levels in various sections of the surface, yet with equal density. He concluded his talk with an appeal to Tool Engineers to enter the field of powder metallurgy to invent, devise and produce new tools for powder metallurgy previously unthought of.

## Chicago

The Chicago Chapter held its regular meeting on Monday evening, January 5, at the Midwest Athletic Club. Despite the near zero temperature, a goodly crowd attended.

After dinner, the meeting was presided over by estimable Chairman S. G. Goransson, who called for nomination and election of the Nominating Committee, who will make up the ballots and slate for the regular election of officers.

The piece de resistance of the technical session was a motion picture in color, entitled, "Heat Treating Hints." This picture and the floor discussion afterwards was presented by one of their local, yet nationally prominent firms: The Lindberg Engineering Company. The motion picture illustrated in excellent fashion the shop methods used by experienced heat treaters and metallurgists. This motion picture follows the theme of the periodical published by The Lindberg Engineering Company known as "Heat Treating Hints."

After the picture was ended, an interesting discussion on Heat Treating Aluminum was led by Mr. G. B. Berlien, Chief Metallurgist, and Mr. R. B. Seger, Superintendent, of the Lindberg Engr. Company. Everyone present derived considerable benefit from the discussion and motion picture.



OFFICERS OF NEW POTOMAC CHAPTER 48 A.S.T.E.  
WASHINGTON, D. C.

Seated, left to right:—R. C. HARBST, Chairman; E. M. SEIFERT, 1st Vice-Chairman.  
Standing, left to right:—E. A. PETERSON, Treasurer; W. O. KELCH, Secy.



# SPEED UP PRINT PRODUCTION ... CUT PRODUCTION COSTS



**WHEN YOUR PRINT MAKING** is complete—  
all purpose—economical—that's when you increase print  
production—reduce print making costs.

With the Ozalid Process your prints are made at savings in  
time—labor—materials—because Ozalid is the only complete  
reproduction process.

Positive-type whiteprints having blue, black or maroon lines  
are made simply by using Ozalid sensitized materials in any  
of its whiteprint machines. They are printed and dry developed  
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This process is time saving because prints are made in two  
easy steps, exposure and dry development . . . the finished prints  
are dry, ready for instant use . . . duplicate originals are made  
quickly just as whiteprints . . . changes, additions and correc-  
tions can be easily made on transparencies without altering the  
original drawing.

Production costs are cut because only one person is needed  
to operate any Ozalid machine . . . the use of cut sheets elim-  
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Ozalid materials lessen the possibility of over-exposure and  
subsequent waste of materials.

Write today for information describing how easily you can  
make prints at great saving with the Ozalid process.

SPECIFY *Ozalid*  
WHITEPRINTS

## BASIC FACTS ABOUT PRINT MAKING YOU SHOULD KNOW

OZALID STANDARD WHITEPRINTS OFFER  
A VARIETY OF EITHER BLUE, BLACK OR  
MAROON LINES ON A WHITE BACK-  
GROUND . . . whereas blue prints offer  
no choice of color.

This variety of Ozalid color lines en-  
ables you to assign an identifying color  
to the office, another to the field, another  
for filing . . . distinguish checked prints  
from unchecked prints . . . lessen the pos-  
sibility of errors.

These Whiteprints are permanent, true-  
to-scale of the original, and will not wrin-  
kle or curl. They are easier to read, write  
on and check than negative prints.



This is the third of a series of facts on  
modern print making. Watch for Fact No. 4.

### OZALID PRODUCTS DIVISION

GENERAL ANILINE & FILM CORPORATION

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*Ozalid in Canada - HUGHES OWEN CO. LTD., Montreal*

**Cleveland**

The Cleveland Chapter held its January meeting on January 9 at Reliance Engineering Company. The speaker was Paul W. Arnold who spoke on the subject, "All Electric Adjustable Speed AC Drives for Machine Tools."

**Detroit**

The January meeting of the Detroit Chapter was held on January 8, 1942 at

Huyler's Concourse Dining Room, Fisher Building. The meeting was preceded by a dinner. Professor J. T. Wilson, B. S., Head of General Electric X-Ray Corporations Diffraction Laboratories was the speaker at the technical session. Mr. Wilson's talk threw new light on the fundamentals of X-Ray diffraction and the application of X-Ray in the radiographic inspection of welds and castings. His talk was of unusual

interest to all because of its vital, practical value in the manufacturing problems confronting American industry today.

**Fond du Lac**

A regular monthly dinner meeting of Fond du Lac Chapter was held last evening at the Hotel Retlaw. The new order of business consisted of selection of the following committee men by the Chapter Chairman, K. F. Gallimore.

Program Committee: A. F. Schroeder, Chairman, Oshkosh; J. F. Celioschow, Oshkosh; R. M. Woytych, Fond du Lac. Membership Committee: Chas. Billberg, Chairman, Oshkosh; H. O. Zentner, Fond du Lac; W. H. Roloff, Kaukauna. Standards Committee: E. J. Kaiser, Fond du Lac. Publicity Committee: Henry S. Faith, Fond du Lac. Industrial Relations Committee: W. E. Rutz, Fond du Lac. Educational Committee: Marvin R. Miller, Fond du Lac. Constitution & By-laws Committee: Ralph J. Kraut, Fond du Lac. Editorial Committee: Henry S. Faith, Fond du Lac.

The members of these various committees will receive a notice of their duties and instructions from the National Society. A nominating committee consisting of W. E. Rutz, as Chairman, and Chas. Billberg was elected for the purpose of nominating a Regional Director and other Chapter officers at a future date. The speaker at this meeting was Mr. B. W. Keese, Chief Engineer of the Wisconsin Axle Division, Oshkosh. His topic was "Man Hours." This subject as noted by Mr. Keese is of utmost importance in the National Defense Program. Since we cannot save man hours, we must conserve man hours by getting more material or production with less expenditure of time and energy.

**(Grand Rapids)  
Western Michigan**

The Western Michigan Chapter held its January meeting at the Browning Hotel in Grand Rapids. The meeting a supper meeting, was attended by 55 members and their guests.

After the regular meeting, the question and answer period was opened. Several questions were discussed to some length and to everyone's satisfaction. During the period, Mr. C. Herbard read a very interesting paper on "What is Involved in Changing Over from Making Auto Body Dies to Large Planers." He described in detail the necessary tools and fixtures, the sub-letting of machine work, and the necessary training of men to operate the fixtures and jigs. The main speaker of the evening was Mr. L. J. Radermacher, President of the



**DOUBLE THE TOOL LIFE**  
*at Half The Tool Cost!*

**WITH SUTTON MASTER  
FEED FINGERS AND  
INTERCHANGEABLE AND  
REPLACEABLE PADS**

One master and different sets of pads will handle practically the full range of work on any machine, and worn out pads can be quickly and easily replaced in the original master. This cuts your tool cost as much as 80%. But, since the pads are separately hardened, to resist wear, and can be ground many times to restore size, they outlast ordinary one-piece feeders two or three times.

**NO PINS OR SCREWS TO WORK LOOSE.** A lug on one of the pads engages a slot in the master; there are no pins or screws to vibrate loose and jam the machine.

**COMPENSATION FOR WEAR**—Double angles on the sides of each pad can be ground down many times to restore hole size, the tension of the master bringing the pads together.

**TAPERED FOR STOCK ENTRY**—Master and pads are tapered to admit stock easily—no jamming.

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FEEDERS • MASTER FEEDERS AND PADS  
PARTS AND ACCESSORIES** for lathes . . . milling machines . . . and automatic screw machines.

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Stoker Unit Corporation of Milwaukee, Wis. His subject was "Precision Boring" as applied to defense work. Mr. Radermacher illustrated his talk with slides, which was very interesting, and the members were disappointed in Mr. Radermacher's having to rush away to catch a plane, which did not give him time to answer several questions which were not quite clear. However, all agreed that they had an enjoyable evening.

#### Hamilton

The December meeting of the Hamilton Chapter proved to be one of the most interesting yet held.

The speaker, Mr. W. W. Criley, General Manager of Ajax Mfg. Company, Cleveland, dealt with the subject of Machine or Upset Forgings in great detail, and his talk was well illustrated with excellent slides and followed by two short films showing the production of Shell Forgings on forging machines.

Before the speaker was introduced, Chairman Dawson pointed out that a large percentage of the forging work in Canada is done in this district, and this was borne out by the large turnout, over 100 members and friends being in attendance at the meeting.

At the conclusion of his talk, Mr. Criley answered various questions as to suitable die steels, also made a comparison of forging machines versus hammers or hydraulic presses.

#### Hartford

The Hartford Chapter held its January Meeting, as is its custom, preceded by a dinner, at the City Club. Dinner was served at 6:15 and was followed by a Coffee Talk by J. Noyes Crary, Supervisor of Air Raid Wardens in the State of Connecticut. The talk was very enlightening and showed everyone what was being done in this vital work and what was yet to be done. After dinner and the talk, the group adjourned to the Gas Company Auditorium where the technical session was held, beginning at 8 p.m. Before the program for the evening started, Chairman Henry Moore called on Carl Moeller for a report on the Chapter Finances which proved to be in excellent condition. Lou Eberts gave a report for George Highberg on the status of the membership committee. The Chapter has passed its quota for the year with plenty to spare. The Chairman called for nominations for a nominating committee of two to nominate new officers. Four were nominated from which George Leitch of Colt's Patent Fire Arms and Bill McCarroll of Pratt & Whitney Aircraft were the members elected to the committee. The meeting was conducted by Harry E. Sloan, Jr., who did a very fine job of introducing the speaker of the evening, Mr. James Slayter, Vice President of Owens-Corning Fiberglas Corporation. Mr. Slayter's talk, although not strictly on the field of Tool Engineering, was one that proved extremely interesting to all assembled. It gave all the members many things to think about. For instance, he mentioned that in some experiments with glass fibers they had so kept the material pure that tensile strengths up to 450,000 lbs. per square inch had been reached with glass. Many wondered what a pure steel or iron might develop if made with such painstaking care. Mr. Slayter stated that the low strengths in many of our materials today are due mainly to impurities of the material.

The uses of glass were traced from the common uses of years gone by to the more modern uses in glass blocks as



*1/16 the thickness  
of a fly's wing!*

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Here is a  
Surface plate!  
6 x 14 ft.*

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Sizes range from this large fellow illustrated above, 72 x 168 inches, down to 10 x 15 inches.

To keep plate level and flat, we have developed a specially constructed standard provided with unique supports. These supports, locked to a fixed position, are designed to withstand vibration.

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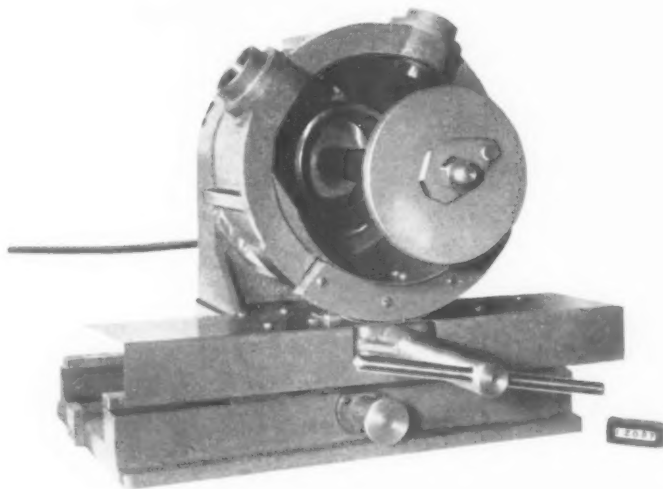
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building material, in filters as the filler, in fibrous form for insulation of buildings and other heat containing spaces, and finally down to the more recent uses of fibrous material in battery plate separators and in the textiles of glass for use in industry. A motor with Fiberglass insulation may be made such that the given power of the motor may be as much as two motor frames higher than other types of motors. This has been used to good advantage in many tight

places where a motor of greater power than there is room for in the ordinary type is required.

The talk closed with the idea that there are so many uses for glass of the type he is interested in that there hasn't yet been time to investigate them all.

A question period followed the talk and proved very interesting also. Many questions were asked and answered; so the meeting wound up in a very successful conclusion.

## Milwaukee

On Thursday evening, January 8, with the weather about 10 degrees below zero, and a necessary change in the program, the boys turned out in goodly number to hear Mr. Malcolm F. Jenkins, Chief Engineer, Firthite Division, Firth Sterling Steel Company, give a lecture on the making of Sintered Carbide Tools, illustrated with slides and movies. This was a very interesting talk, and the discussion which followed the formal lecture was very inspiring, and a good many of the men participated in the Round Table. The speaker was well acquainted with his subject, and gave direct and pertinent answers, which, after all, was what the men came there for.

Beaming, and with a great big smile, was Lawrence J. Radermacher of the Stoker Unit Corporation, who was there with twelve others of his company. Closely pressing the Stoker Unit Corporation, was Foster Kuehn and eleven others of his stalwarts representing the Falk Corporation. It was also interesting to see that the McCullough Engineering Company was also there in full force. These boys have set a very high standard for attendance, and it will be up to some of the other concerns to see that they out-do some of the Companies spoken of.

The next meeting will be on "Plastics in Defense," and will give some of these concerns a good opportunity to see whether they are plastic or whether they are flexible.

## (Minneapolis-St. Paul)

### Twin Cities

The January meeting of The Twin City Chapter was held at Dunwoody Industrial Institute on January 14, 1942 at 6:30 P.M.

The speaker at the technical session was Mr. E. W. P. Smith, Consulting Engineer, Lincoln Electric Company whose subject was "The Shielded Arc and its Application to the Design and Construction of Jigs and Fixtures." Mr. Smith's talk dealt with the Shielded Arc, what it is and how it works; the result in fine quality and strength of joints and how easy it is to put together. His talk was illustrated by slides having to do with jigs and fixtures and included a study of a few joints by means of polarized light.

## Greater (New York)

Close to two hundred members attended the January meeting of the Greater New York Chapter held at the Hotel New Yorker on January 5.

National President, Frank Curtis,

THE TOOL ENGINEER

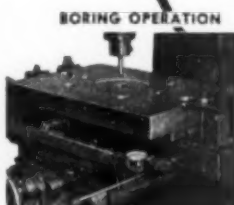
# FOUR-IN-ONE!



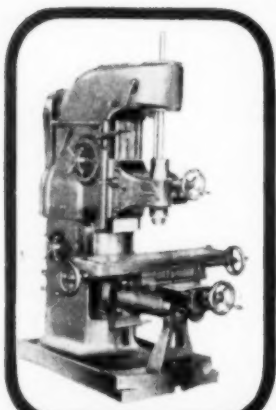
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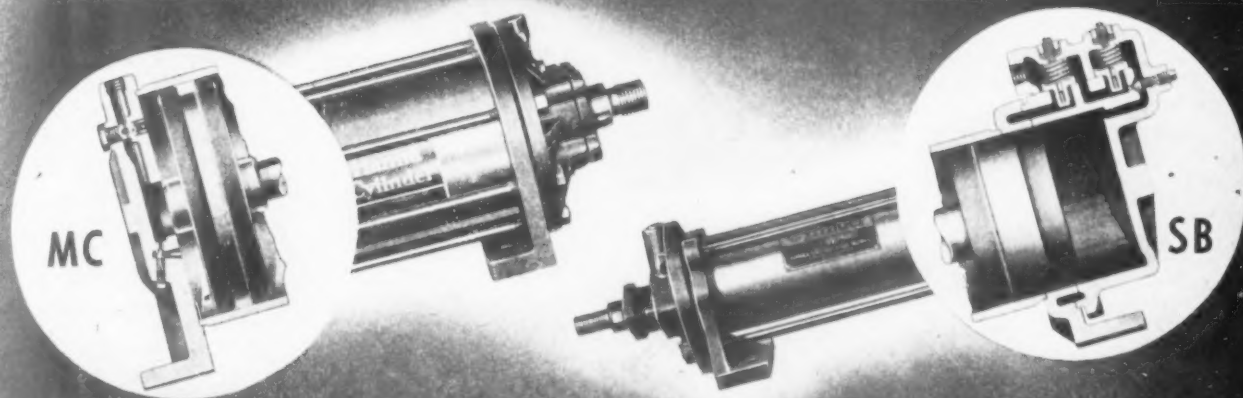
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Apex Universal Joints have no projecting ears, screws or sharp corners to catch; can't overtravel their working angle of 35° and lock; are durable and smooth running.

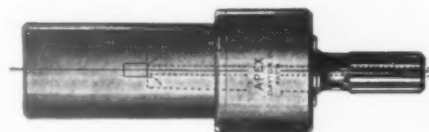
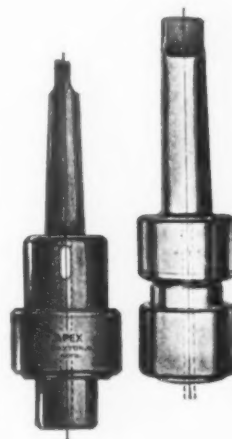
Apex Universal Socket Wrenches are available for all kinds of speed braces and extension shanks.

Apex Safety Friction Chucks maintain their friction setting... are not affected by end thrust...

can be used in any position... tools can be changed while machine is running... chuck slips before breaking tool—these features save time and money.

Apex Floating Tool Holders make possible accurately reamed and tapped holes on any type equipment... amount of float varies from a few thousandths to 1/8"... with Quick Change Drill collet, tools for series of operations can be changed without slowing down the machine... available in Extended Socket and Short Nose types for Morse Taper or straight shank tools.

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talked on the subject, "Tool Engineering", dealing largely with the design of jigs and fixtures for the interchangeable manufacture of mechanical products. The first part of President Curtis' talk covered such fundamentals as methods of locating, clamping, etc., none of which he pointed out can be safely overlooked in the execution of any project however large. Many of the common errors that so often cause trouble in tool design were analyzed from the stand-

point of the correct principles which should be observed. The second part of the discussion was given over to various high production fixtures and machines. A highly interesting series of slides was used to illustrate the important features described by President Curtis.

In commenting on Tool Engineering, President Curtis said, "The competitive technical advantage of one plant over another usually lies in the quality of jigs and fixtures rather than in machine

tools. In view of this, tool design is recognized today as one of the most important factors in the manufacturing field. An efficiently designed product is no better than the tooling used for its manufacture. Therefore, management must provide for adequate tooling facilities in order to assure low-cost production."

Mr. F. Horton of the International Projector Corporation and Mr. H. L. Horton of The Industrial Press were elected as members of the Nominating Committee to bring forward a slate for the forthcoming election.

## Now more than ever you need this help for Training Tool and Die Makers

Widely used by many companies and trade schools throughout the U. S., it meets urgent need for a complete, up-to-date text for training new men, "refreshing" older men, or trouble shooting in the tool room. The shortage of tool and die makers must be met fast by men who know the "whys" and "hows". This book gives them both and more. It shows how to select tool steel; how to make tools; how to avoid trouble; how to improve tool performance. Read below what others say about this modern text.

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315 pages — 205 illustrations

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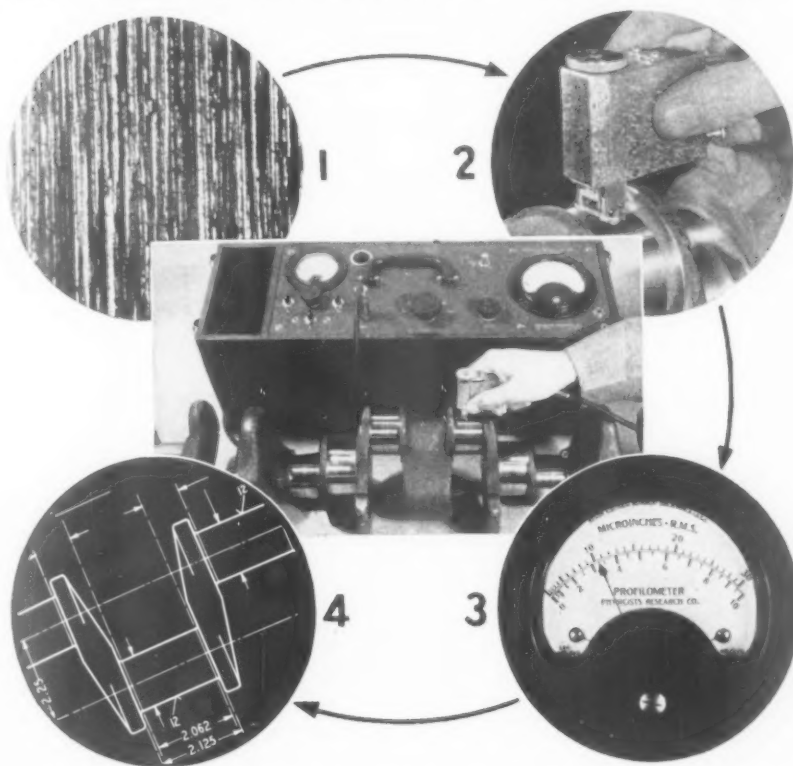
### Northern New Jersey

One of the best technical sessions of the past year was held by this Chapter on January 13 at Newark, N. J., when Malcolm F. Judkins, Chief Engineer, Firthite Division of Firth Sterling Steel Company, spoke on the manufacture and use of cemented carbides. After exhibiting some movies and slides, Mr. Judkins was on his feet for over an hour answering questions, largely with the aid of a black-board and chalk sketches. His main plea was that users of cemented carbides tip their own blanks in order to relieve the present shortage of finished tools due to the definite shortage of tool making labor in the plants supplying carbide tipped tools. Herbert Hall, past chairman of the Chapter, and John Cetrule, were elected members of the nominating committee at this meeting. Bill Dinger, Membership Chairman, was pleased to report that the Northern New Jersey Chapter stood third in the membership cup race, having pulled itself out of the deep hole of 33rd place by getting in a lot of new members and reducing the number of dues delinquents. Charlie Bazaz, entertainment committee chairman, assured the boys a good time at the Gay Nineties Dinner Dance scheduled for the coming week in the ballroom of the Hotel Robert Treat, Newark.

### Peoria Area

The Peoria Chapter began 1942 with a meeting January 6 at the Creve Coeur Club at which Mr. Lincoln E. Mehlhope, Sales Engr. with the Cincinnati Milling Machine Company, spoke on the "Centerless Grinding Machine as Applied to Shop Production." Mr. Mehlhope described the principles of the design of the Centerless Grinder and showed how those principles are applied to (1) straight through grinding, (2) multi-diameter grinding and (3) the grinding of headed work. By means of slides, he illustrated the application of the machine to the grinding of many types of

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Taken as a typical example is the measurement of crankshaft bearing surfaces. The use of Profilometers is not limited to fine surfaces. They can be used wherever accurate information is required on surfaces of practically any degree of roughness.

**1** In a photomicrograph, taken at 100 diameters with oblique illumination, the ground surfaces of the crankshaft appear as shown in this illustration. The measurement of the surface irregularities, clearly indicated here, is the purpose of the profilometer.

**2** In order to secure a reading, it is only necessary to move the Profilometer tracer across the ground surface. The diamond tracer point "bottoms" the irregularities. The tracer is of a small size which makes it convenient for measurement of practically any surface against which the corner of a pack of cigarettes can be placed.

**3** The movements of the tracer point are transmitted to the meter which gives direct dial readings in true inch units. No computations or methods of visual comparison are required.

**4** Today, roughness ratings are specified on thousands of blue prints. The usual method is illustrated on this detail drawing on which the rating for the ground surfaces is specified as 12 micro-inches. When the Profilometer readings are within the accepted limits of the specification, the surface finish is known to be correct.

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shells for the ordnance department. His talk was preceded by two very fine technicolor films presented by the United States Army Recruiting Service. One, "The Tanks are Coming", depicted the training of a tank crew, and the other, "Wings of Steel", dealt with the training of a bomber crew.

#### Philadelphia

The regular monthly meeting of the Philadelphia Chapter was held on De-

cember 18 at the Philadelphia Engineers' Club with 194 members and guests present.

After dinner, an exceptional motion picture in technicolor called "Steel for the Ages," featuring the manufacture of stainless steel by the Allegheny-Ludlum Steel Company was shown.

National First Vice-President, Otto W. Winters was introduced by Chairman John McMonagle. Mr. Winters talked on the subject of "Emergency Defense

Training." The members surely enjoyed Mr. Winters' talk and showed a very decided interest in the subject. After the Chapter's regular business was finished, those present were entertained by six fine acts of floor show.

#### Pittsburgh

On Friday evening, January 9, the Pittsburgh Chapter held its monthly meeting at McCann's Restaurant, Pittsburgh. A rather small number of members turned out, due undoubtedly to the frigid weather. However, the fifty men who came listened to a very interesting talk by Mr. E. H. Alexander, Engineer for the General Electric Company, Schenectady, on the application of Photo Electric tubes to temperature measuring devices or pyrometers, to counting and sorting devices and to controlling apparatus for regulating flow of materials being processed. At the conclusion of the meeting, a rising vote of thanks was given to Mr. Alexander.

#### Portland

The Portland Chapter held its monthly meeting at the Lafayette Hotel, Portland, on Friday night, January 10, with an appetizing dinner.

After dinner, Chairman Ned Andrews introduced Mr. Alexander M. David of the Firth Sterling Steel Company, who gave a very interesting, as well as instructive talk on National Defense and Carbide Cutting Tools.

#### Potomac

The Potomac Chapter held its charter meeting in Washington, D. C., Thursday evening, January 8, at the Naval Lodge Hall, just about six months after initial preparations were started to organize a group at our Nation's Capital. Much of the ground work for the formation of this Chapter was handled by Raymond C. Harbst of the Naval Gun Factory, who befittingly enough was elected First Chairman.

Other elected officers include Ernest M. Seifert as First Vice-Chairman; Harold P. Berry as Second Vice-Chairman; Edward A. Peterson as Treasurer; and William O. Kelch as Secretary.

National President, Frank W. Curtis, presided at the meeting and presented the charter to Chairman Harbst, remarking that "Potomac Chapter should develop into one of our most prominent and successful groups." Ray Morris, 2nd. Vice-President, also spoke at the chartering ceremonies and assisted our President in the many duties necessary in getting a new Chapter on its way. Chairman Godfred Steiner of Baltimore Chapter, came down for the event and

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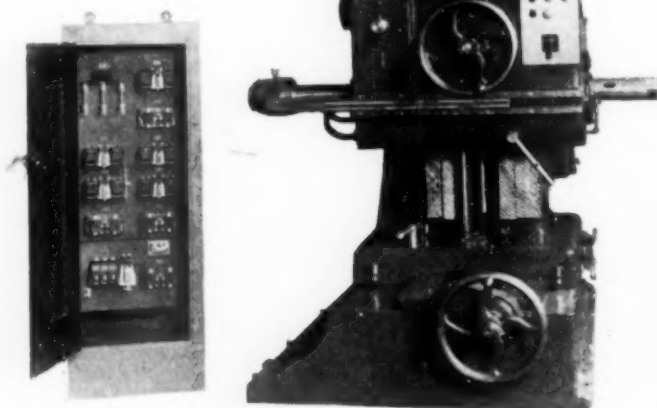
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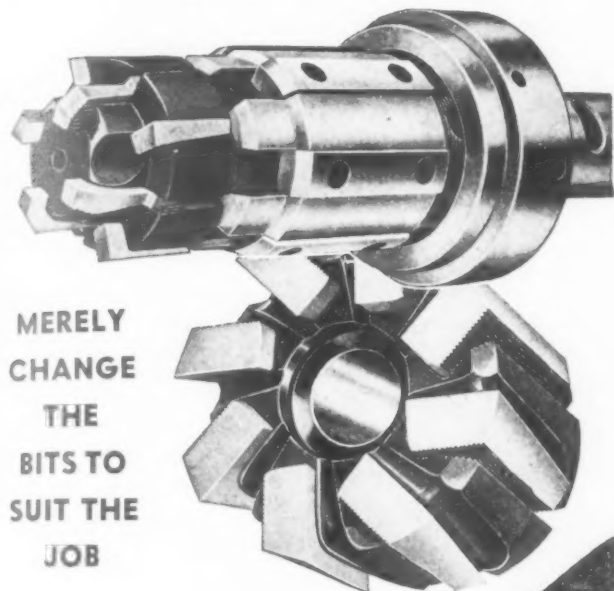
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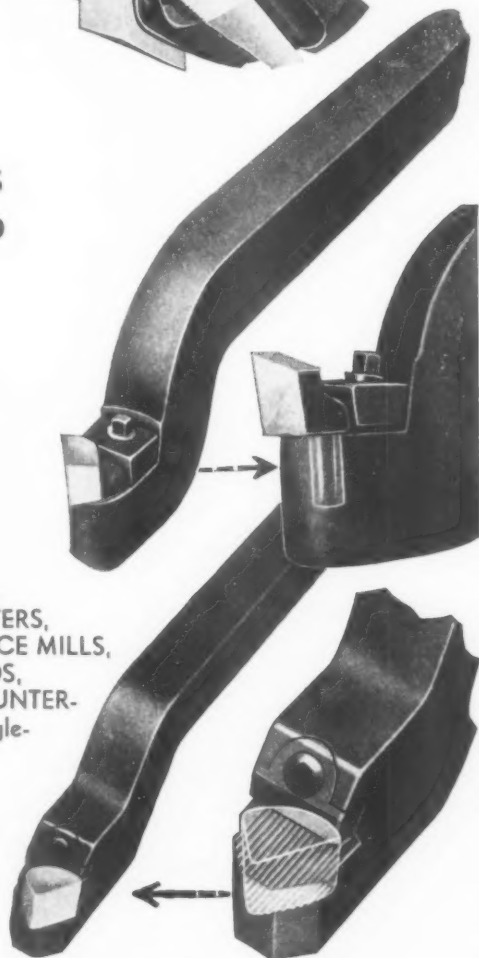
One Tool Adaptable  
To Many Different Cuts



MERELY  
CHANGE  
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BITS TO  
SUIT THE  
JOB

CONSERVES  
HIGH SPEED  
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AND  
SPEEDS  
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FEBRUARY, 1942

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gave the new members a "pep" talk by outlining the many advantages our Society has to offer and how Chapter meetings benefit each and every member.

A committee headed by E. C. Adams, was appointed to investigate a suitable meeting place for the first technical session to be held February 5. The first Thursday of each month was selected as the regular meeting night, and decision was also made to have a dinner preced-

ing each meeting for those who could conveniently get down. Various committee men will be appointed by Chairman Harbst at the February session.

The Potomac Chapter as a name was appropriately enough selected for this group, since members from nearby plants in Maryland and Virginia, as well as in Washington itself, will form the membership. Several names were suggested but Potomac appealed to all the charter members.

## Racine

The Racine Chapter of the American Society of Tool Engineers held its January meeting on January 12. The meeting was attended by over 100 members and presented dual speakers John L. Graham of Pressed Steel Tank Company and C. R. Larson of Racine Plating Company. Questions of current importance as contained on the attached announcement were thoroughly discussed and the meeting from every standpoint was worthwhile.

## Rochester

The Rochester Chapter held its monthly meeting on January 14 at the University of Rochester, River Campus.

A few facts about sabotage, espionage, and general subversive activities on the part of enemies of our country were related by Rochester's Federal Bureau of Investigation representative. After a hearty meal at the Todd Union, University of Rochester, eighty odd members of both the A.S.M. and A.S.T.E. relaxed and heard young Cliff Sears introduce Mr. J. F. Trosch of the F.B.I. Mr. Trosch vividly described the nature of the F.B.I.'s work in counteracting acts detrimental to defense production as well as Government undermining. He gave the listeners a comprehensive idea of what does happen and what is expected to happen. He pointed out how each and every listener could help do his part to prevent happenings that might easily handicap the operation of both the Government and the functioning of our armed forces.

Adjourning to the Lower Strong Auditorium the guest speaker of the evening faced about 150 listeners. After a few remarks by the A.S.M. Chairman Roy Lusink, Vice Chairman Cliff Sears, Sr. introduced Mr. H. W. Wills, Metallurgist of the Allegheny Ludlum Steel Corp. who presented a most comprehensive talk on tool steels. Starting off, Mr. Wills pointed out that though tool steels comprised no more than 1% of the American steel tonnage, it was the most critical 1%. He related the problems encountered in working out new tool steels which made possible the elimination of elements now practically impossible to secure in sufficient quantities. Particular emphasis was placed on substitutes for the Asiatic element tungsten.

Tests, results, working problems, hardening methods, and the advantages of the molybdenum tool steels were discussed by Mr. Wills at considerable length. His talk was aided by the use of slides showing micro-photographs, performance charts and interesting sta-



### TIMELY SUGGESTIONS

... for chuck users. Published by The Cushman Chuck Company in the interest of better service during the National Defense emergency.

HERE'S YOUR PRIORITY

SITUATION "IN A NUTSHELL"

★ You are busy, we are busy, and it will help us both if we can avoid as many delays and save as much correspondence as possible. Hence these few suggestions regarding the placing of orders for Cushman Chucks, which as you know are classified by O.P.M. with machine tools and similar equipment.

First, please realize that all chucks now have a war job to do. We cannot accept any orders that do not carry proper authorization.

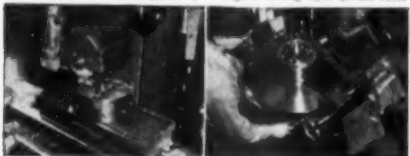
Secondly, bear in mind that forms PD25C, and PD25D cannot be applied on orders for

chucks but do apply to orders for replacement parts.

Orders for chucks should always be accompanied by form PD3 or extension of a general preference order that is applicable to machine tools and similar equipment. Lathe chucks are not considered as a part of the "defense supplies" group.

Finally, please be sure that Cushman is anxious to do everything possible to help in solving your problems. Do not hesitate to call on us for any help or advice you may need, particularly in regard to conservation of your present Cushman Chucks.

Finish grinding of master jaws after fitting to assure interchangeability. Balancing chuck bodies for tapered flange and long taper spindle noses.



# CUSHMAN

THE CUSHMAN CHUCK CO. HARTFORD, CONN.  
CHUCKING ENGINEERS • SINCE 1862



# After the Emergency ... What?

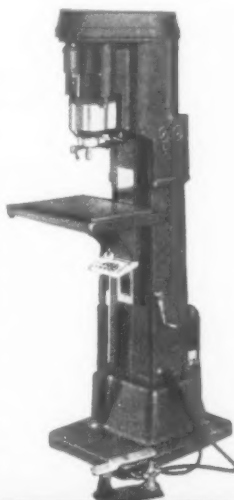


Tooled today for war time aluminum fuse bodies, this *standard* Haskins Tapper can quickly and inexpensively be changed over to peace time production needs.

It's natural today to think of machinery in terms of *immediate* output. But when the war's over—what then?

That is when the *lasting* quality of really fine equipment will pay its greatest return.

Haskins Tappers bought today for war time production are *standard* machines. A few quickly made adjustments—perhaps an inexpensive fixture change—and your Haskins Tappers will be ready to help you hold down peace time production costs—so that you can keep sales and profits up! R. G. Haskins Company, 2756 W. Flournoy Street, Chicago.

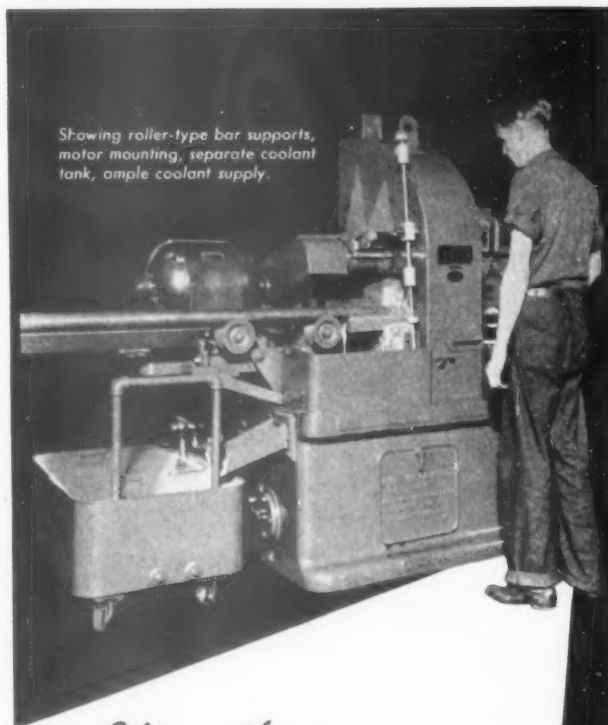


WRITE FOR BOOKLET  
—“Holding Fixtures for  
Haskins Tapping Ma-  
chines.” Contains many  
new ideas.



## HASKINS

*Precision*  
TAPPING  
EQUIPMENT



Showing roller-type bar supports,  
motor mounting, separate coolant  
tank, ample coolant supply.

## It's Here—YOUR ABRASIVE CUTTING MACHINE FOR FASTER PRODUCTION

It is the new No. 425 CAMPBELL CUTALATOR—uses a method that definitely gives you faster production and that handles practically all analyses up to  $3\frac{1}{2}$ " diameter solid stock and  $4\frac{1}{2}$ " diameter tubing—annealed or unannealed.

Micrometer work stop makes for fast set up and accuracy.

Cuts are so clean that you save time and cost of finishing.

You get new cutting speed, freedom from burning, longer wheel life.

Write for a copy of the folder that gives complete details. At the same time, tell us something of your cutting requirements. Our suggestions won't obligate you at all.

**ANDREW C. CAMPBELL DIVISION**  
BRIDGEPORT • CONNECTICUT

*Campbell*

**ABRASIVE  
CUTTING MACHINES**

AMERICAN CHAIN & CABLE COMPANY, Inc.  
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tistics concerning these new types of cutting materials.

To top off the evening, Mr. Wills showed a moving picture depicting the part Allegheny Ludlum is playing in National Defense. It was a well-gotten up movie which drove home the fact that present military ordnance is effective in proportion to the efficiency of the steel industry as a whole.

#### Rockford

The January meeting of the Rockford

Chapter was held on January 8 at the Hotel Faust. Lincoln Melhouse, Director of Sales Engineering, Cincinnati Milling Machine, spoke on the subject of "Grinding".

#### Schenectady

The regular monthly dinner meeting of the A.S.T.E. was held January 8 in the Danish Hall, Schenectady. Approximately 75 members and guests were present. After an enjoyable meal, Mr. A. Schuneman conducted a business

meeting at which a nominating committee composed of Messrs. G. E. Lauterborn and C. Sertl were elected by the membership. This committee will report its findings at the February meeting.

Following the business meeting, Mr. B. G. Tang, General Superintendent of Schenectady Works, introduced the speaker of the evening, Mr. H. J. Beattie of the Manufacturing General Department of the General Electric Company, who spoke on the subject of "Material Handling."

Mr. Beattie stressed the importance of material handling in modern industry. During the last six years, one of industry's greatest bottlenecks has been eliminated by improved methods in material handling.

Mr. Beattie stated that the battery fork truck has been one of the main factors in increasing the flow of material and the conservation of floor space. He further stated that by the use of pallets for stacking purposes, and by designing trucks for specific jobs, the fork truck can be adapted to any type of industry. Mr. Beattie pointed out that the use of pallets for stacking purposes was vital to our Defense Program, in that much valuable floor space could be utilized by efficient stacking methods. His talk was illustrated by slides and a motion picture.

After Mr. Beattie finished his talk, he introduced Mr. Fred Van Lew of the New Jersey Edison Storage Battery Company, who presented a sound motion picture on the uses of battery trucks.

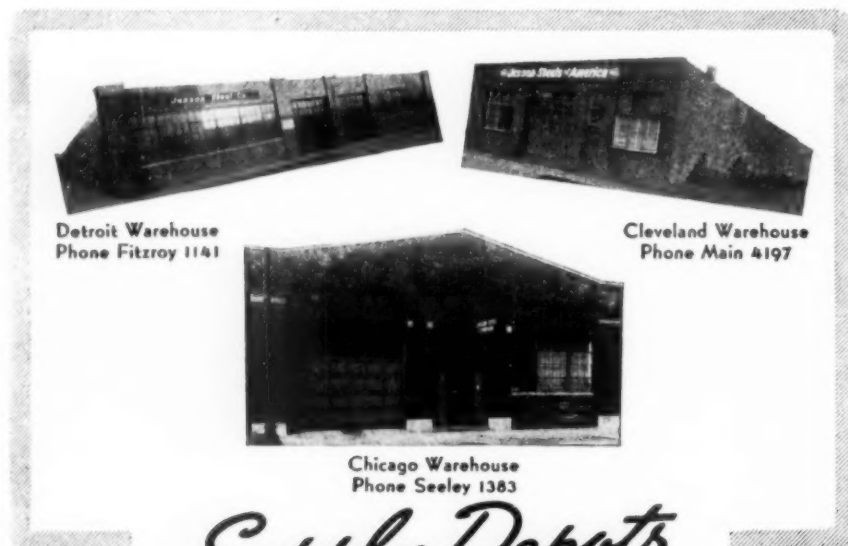
Also present at this meeting were Mr. Edward Porter, Mr. Ray Smith, and Mr. R. A. Leanitte of the Automatic Transportation Company of New York.

#### South Bend

The South Bend Chapter held its January meeting on the 13th at the Indiana Club. A very good crowd was present.

Horace Wentzell, Chairman of Chapter 30, presided and first introduced guests at the speakers' table. Captain H. T. Burnett and his aids, who are in charge of Naval training in the R.O.T.C. at the University of Notre Dame, were the first guests introduced. Capt. Barnett gave a short talk on his work and what the men at Notre Dame could eventually get out of the course.

The main speaker for the technical session was Mr. H. W. Wills of Allegheny Ludlum Steel Corp., who gave a very interesting talk on comparison of Molybdenum and Tungsten High Speed Tool Steels for production. Then Allegheny-Ludlum presented a sound film "A Job to be Done," which depicted the



## Supply Depots FOR The "Battle of Production"

With America again engaged in a world war, immediate deliveries of tool and die steels to the Nation's factories is of prime importance. The five warehouses of the Jessop Steel Company (three illustrated above), as well as our numerous branch offices and agents, are strategically located to expedite deliveries of Jessop tool steels, alloy steels, stainless steels, and composite steels. Consult your telephone directory—or write to our general office in Washington, Pa.—to locate the branch nearest to you.

JESSOP

**JESSOP STEEL COMPANY**  
General Offices and Works  
**WASHINGTON, PENNA., U. S. A.**

**JESSOP STEELS FOR AMERICA AND HER ALLIES**

**CARBON · HIGH SPEED · SPECIAL ALLOY · STAINLESS · COMPOSITE STEELS**

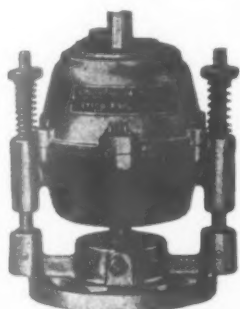
## Easing the production job for Tool Engineers

**Ettco-Emrick**

### MULTIPLE TAPPING AND DRILLING HEADS

These Heads ease the job because they make possible **highest tapping and drilling production** right on the ordinary drill presses that every metal working shop already has.

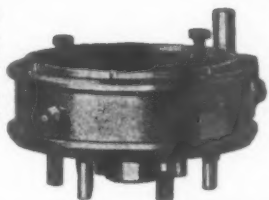
#### THE 3 ELEMENTS OF THE SYSTEM



(1) A standard high-speed, sensitive friction clutch and face plate driving unit with automatic reverse, for tapping. This unit comes in four sizes.



(2) A standard ball-bearing face plate driving unit for drilling.



(3) A gear case unit containing standard gears, spindles and chucks, assembled in the arrangement worked out by Ettco-Emrick engineers to meet the requirements of each individual multiple tapping or drilling job.

#### OUTSTANDING FEATURES

All parts are standard, which makes the cost low.

All gear case units are **interchangeable** on the tapping and drilling face plate driving units. Thus, only one to four tapping units and one drilling unit are needed to handle the gear case units for any number of multiple tapping and drilling jobs—and the change from one job to another can be made in a few minutes.

QUILL CLAMPS can be furnished for fastening heads rigidly to any drill press.

GET FULL DETAILS IN BULLETIN No. 6

A copy will be mailed to you on request.

## ETTCO TOOL CO.

586 Johnson Ave., Brooklyn, N. Y.

DETROIT

CHICAGO



FEBRUARY, 1942

WOODY SPENCER SAYS:  
"The right blow at the right time won a heavy-weight crown."



At Madison Square Garden—June, 1934, in the first round between Max Baer, the challenger and Primo Carnera, the champion—Carnera whipped three sharp lefts to Baer's mouth. Baer replied with a right that sent Carnera to the canvas. Although the fight continued to the 11th before Carnera murmured, "Fini", it is said he never fully recovered from this first paralyzing smash. For Baer—the right blow at the right time won a championship.

Strike a blow at low production. Make sure you are using the right tap for each tapping operation. The right tap at the right time means the difference between expensive, mediocre production and all out production at lower cost. To help select the right taps for your jobs, Wood & Spencer engineers are ready to serve manufacturers without obligation. Simply write us outlining your problem. The Wood & Spencer Co., 1918 E. 61st Street, Cleveland, Ohio.

*"The Right Tap at the Right Time"*



125



expansion of the steel industry to cope with national defense needs.

### Springfield (Mass.)

Our National President, Frank Curtis, was the guest speaker at the January meeting of the Springfield Chapter. Mr. Curtis acted in a dual role at this meeting. Before his technical talk, he gave an interesting half hour telling about some of the things he had seen in his travels through the country in his capacity as National President. Mr. Curtis

told about the marvelous work he had seen at the different aircraft plants and about the planes that were already coming off the assembly—ones in a good many cases with speeds that were thought impossible a year ago. When Mr. Curtis had finished, the members all felt a little bit more reassured that they would come out on top in their war effort.

Mr. Curtis also mentioned the activities and the progress that the different Chapters throughout the country had made was gratifying to them as the

Springfield Chapter is proud to have their former Chairman as the National President. After a brief intermission, Mr. Curtis gave an interesting discussion on Tool Engineering illustrated by slides and a lively discussion period followed.

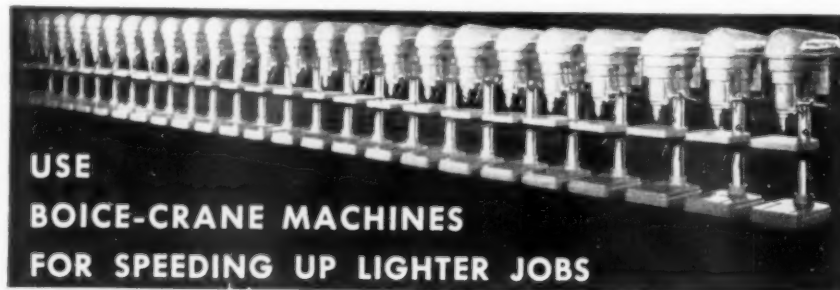
### Twin States (Springfield, Vt.)

The Twin States Chapter held its monthly meeting at the Masonic Temple, Springfield, Vt., on December 10, 1941. The meeting was called to order by Chairman Wilbur Handy. There were 75 members present who enjoyed the fine dinner which had been prepared by the members of the Eastern Star.

The speaker for the evening was Mr. J. Pilling from the White & Bagley Company, Worcester, Mass. Mr. Pilling's subject was "Grinding Lubricants and their Uses." This subject turned out to be a rather complex one but Mr. Pilling described the various products now on the market and indicated which ones were best for the many different applications. Mr. Pilling had many different samples showing the different types of grinding lubricants and also had a display of many complex parts, the production of which had been made simple by the use of the products he had to offer.

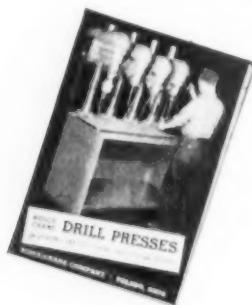
### St. Louis

The first 1942 monthly dinner meeting of the St. Louis Chapter was held at the Melbourne Hotel on January 8 with a good attendance of members. Chairman Burnside reported on the "Bigger and Better Christmas Party" that was the happy occasion for the members and their families to get together and have a jolly time. The financial side of the party was not quite so successful, for the records show a decided loss on the affair. However, the treasury is in a healthy condition and can well handle the deficit. The most successful technical session was carried out by three of their own Chapter's boys, Ed. Doogan, Ernie Nieman, and George Eichelsbach. Mr. Doogan was the first speaker and briefly mentioned the various phases of Tool Design, such as No. 1-Conventional Tool Designing, No. 2 Punches and Dies, No. 3 Die Castings and Plastic Moulding, No. 4 Rubber Moulds and Bakelite Moulds, No. 5 Designing of assembly fixtures for airplane parts. It was on the 5th item that he made his stand and gave a clear and most instructive talk on this somewhat new phase of Tool Design. Mr. Nieman did not stress any particular phase of Tool Design, but made his remarks more general, while dealing with problems involving fatigue, safety, wasted motions, etc. His talk was also of an inspira-



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FOR SPEEDING UP LIGHTER JOBS

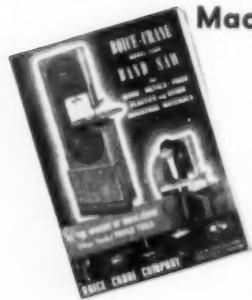
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Folder No. 1 lists over 60 Boice-Crane Drill Presses to  $\frac{3}{8}$ " and Tappers to  $\frac{1}{2}$ " capacity. No. 2 covers our 8-Speed All-Purpose Band Saws.

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Machines Free For Big Work



It's so logical in today's forced production to use your large, hard-to-replace machines on large operations **only**. Load the smaller jobs on lighter, speedier, less costly **and** easier-to-get Boice-Cranes, and the benefits double up. Get more out of your big machine—and the **extra** saving of running the lighter jobs at reduced cost on a machine designed specially for that class of work.

**The Boice-Crane 8-Speed Band Saw  
Cuts Everything**

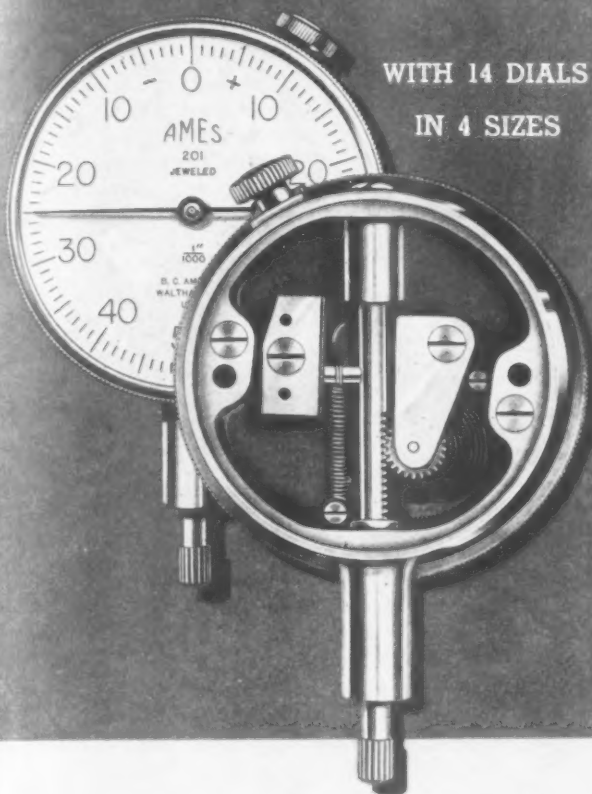
The new Boice-Crane is the perfect small band saw for production, tools, dies, foundry and experimental work. 8 speeds cut many materials. Powerful gear drive.



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These Dial Indicators have all the desirable features for measuring and checking accuracy. Four sizes to American Gage Design Committee specifications. Fourteen different dial numberings. One-piece, drop-forged cases and stems. Wire attached bezels. Cup-shaped dials that need no springs beneath. Pinions and staffs of hardened steel, ground for accurate fitting and long wear. Various styles of backs and contact points. The best and most effective shock-absorbing wheel assembly, optional.

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# TIME-SAVINGS

UP TO **300** PERCENT

IN POLISHING • PRE-POLISHING  
AND FINISHING METALS

A unique, elastic rubber compound impregnated with abrasive, which is already saving up to 300% in finishing time in a number of important war industries. The soft rubber binder cushions the abrasive, giving Brightboy a utility quite different from a grind or a buff. In operation the abrasive recedes into the resilient rubber, falling free as the soft rubber binder is worn away. Its light action produces a smooth finish, pre-polish or polish on all kinds of metals with a minimum dimensional loss of material.

MADE IN TABLETS, STICKS AND SPECIAL SHAPES FOR HAND WORK. MADE IN WHEELS FOR USE ON ELECTRIC AND PNEUMATIC STATIONARY AND PORTABLE GRINDING AND FINISHING MACHINES AND FLEXIBLE SHAFT EQUIPMENT. No special setup necessary. Brightboy is ready for immediate use.

**SPEEDS UP POLISHING and FINISHING**  
**REMOVES HEAT MARKS AFTER WELDING**  
**SMOOTHS and FINISHES PARTS AFTER SHAPING**  
**REMOVES LIGHT BURRS and ROUGH EDGES FROM STAMPINGS**  
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Sold and stocked by leading distributors. If your regular distributor cannot supply you, write us. **THERE'S NOTHING LIKE BRIGHTBOY.** See it, test it. You'll find hundreds of applications for it in your plant.

**BRIGHTBOY INDUSTRIAL DIVISION**  
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WHEELS

STICKS

TABLETS

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WELDON ROBERTS

# Brightboy

The **SOFT RUBBER** binder  
**CUSHIONS** the abrasive

tional character, because he stressed the necessity of getting things done, in order that the tools of war may get into the hands of our soldiers and sailors as rapidly as possible. Mr. Eichelsbach proved a most capable lecturer, as, in his lucid manner he described the action of a huge hydraulic press that formed the sheet metal top of a gas stove. He also explained that even when equipped with such a fine press, you get many headaches as a result of

stretching, tearing, and creeping before you get perfection. The Chapter would like to have meetings of this character,

### Syracuse

Our editorial reporter in Syracuse has been reporting the doings of his Chapter in this column. He thus reads with interest of the activities of other A.S.T.E. Chapters. Members may read in this column about the serious work fellow members are doing in the other Chapters,

about the clambakes and other fun planned at intervals and news about men whose mention in serious or light vein recalls acquaintanceship.

This is also a good time to proffer approbation to the fellows at the head of our National organization for their energetic execution of their offices during these serious and busy times. A word of credit will certainly help them to carry on. Nor should we overlook mention of the TOOL ENGINEER, our National publication. The articles in it have been instructive and timely. Our editorial page is good inspiration. We like what Handy Andy says. And, incidentally, Syracuse Chapter has a local organ—the Syracuse A.S.T.E. News, announcing meetings and other matters of import to the Chapter, plus a column of personal highlights, in the vein of the excellent Handy Andy. Copies of the Syracuse A.S.T.E. News will be mailed to other Chapters if requested. The Syracuse Chapter is planning on having a dinner dance on Friday, February 13, at Drumlins Country Club. Larry Kirk, Chairman of Entertainment, assisted by Willard Parish, are in charge of arrangements. A splendid evening of entertainment for the members and the ladies will be provided. This social event was discussed at the regular monthly meeting held on Jan. 13. During the business meeting which preceded the technical talk a nominating committee was chosen by ballot who will draw up a slate of Chapter officers to be voted upon at the next meeting. Ray Cannon and Marty Berry will present their candidates at the February meeting.

The technical feature of the January meeting was a showing by H. E. Linsley of Wright Aeronautical Corporation, of the film depicting the manufacturing processes involved in the production of a Wright Cyclone 14-cylinder radial air-cooled aircraft engine. Mr. Linsley also showed a film of some of the production methods used at the new Cincinnati plant. The meeting was well attended with the number present being the largest for any meeting for several months.

### Toronto

January meeting of Toronto Chapter on the ninth maintained the current high attendance, some ninety-five having dinner, with a score or more coming in later.

Nominating committee consisting of the perennial Arnold Thompson and John Burke were named to submit nominations for the election at the February meeting, and then speaker H. A. Frommelt, of Kearney & Trecker Corp., Milwaukee, presented his very interesting

## "Versatility" and "Speed" Characterize these two MARVEL SAWS

● For the stockroom of this special machinery builder, what better combination could you ask . . . a MARVEL No. 8 Metal Cutting Band Saw for versatility, and a MARVEL No. 4B High Speed Hack Saw for miscellaneous cutting-off.

For all-around versatility, the universal No. 8 Saw is unequalled. It will cut at any angle from 45° right to 45° left; will nip off a 1/8" drill rod or cut down an 18" x 18" die block. It has a large "T"-slotted planer type table for setting up big work and a quick action machine vise for small pieces. It has a combination hand and/or power feed. It does cutting-off, mitering, notching and indexing, and saves hours of machining by roughing pieces and parts to size or shape. In many shops it eliminates warehouse delays and "cutting extras."

The MARVEL 4B Hack Saw is an exceedingly fast-cutting, light-duty saw (Capacity 6" x 6") designed for high-speed cutting-off. It is designed for miscellaneous "run-of-the-hook work" and is surpassed in speed only by the heavy-duty, all-ball-bearing MARVEL 6, 6A, or 9A High-Speed Saws.

Buy from your local distributor.

**MARVEL SAWS**

**ARMSTRONG-BLUM MFG. COMPANY**

5700 Bloomingdale Ave. "The Hack Saw People"

Eastern Sales: 225 Lafayette St., New York

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Patented process of heat treating brings Molys to parity with Tungsten and Cobalt high-speed steels! Combines maximum abrasive resistance value with toughness comparable to 14-4-1 or lower. Extensively used by leading manufacturers and tool makers. If inability to obtain Tungsten and Cobalt types of high-speed steel is handicapping your machine tool operations by shortening tool life or decreasing tool applicability, you'll find it worthwhile to investigate Tuff-Hard. Tuff-Hard bits in various sizes now available for immediate shipment! For full information and prices, write or wire.

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STEEL HEAT TREATING  
TUFF-HARD PROCESS CUTTING TOOL BITS

## THE NEW CLEVELAND No. 1 VERTICAL MILLING MACHINE

Built for the exacting needs of the tool room with a ruggedness making it adaptable for heavy-duty production.

It is a completely new machine designed and built with these requirements in mind.

### Features

#### CAPACITY:

Longitudinal feed—18"  
Cross travel—8 1/2"  
Vertical travel—16"

#### SPINDLE SPEEDS:

Choice of two ranges  
(a) 12 speeds — 100 r.p.m. to 1750 r.p.m.  
(b) 12 speeds — 200 r.p.m. to 3450 r.p.m.

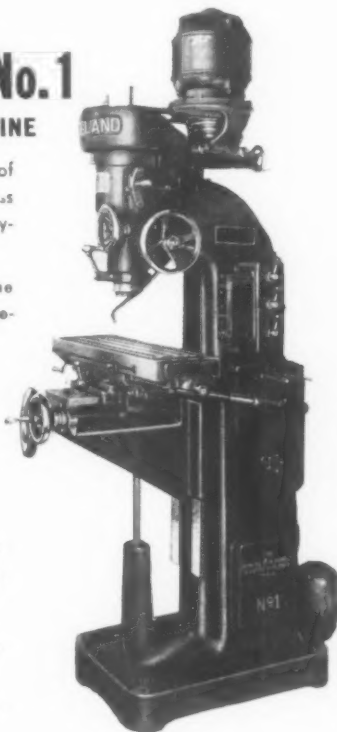
#### TABLE:

Working surface—8" x 32"  
Twelve feeds with range from .6" to 12 1/2" per min.

#### FLOOR SPACE:

36" x 42" front to back x 87" high

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FEBRUARY, 1942

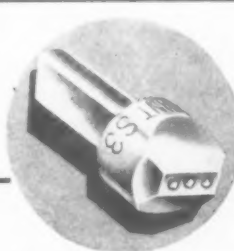
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**SIEWEK'S** STAFF OF EXPERIENCED AND DEPENDABLE ENGINEERS IS READY TO SOLVE YOUR ENGINEERING PROBLEMS . . . TO HELP YOU ROLL NEW PRODUCTS INTO PAYING PRODUCTION. EQUIPPED TO HANDLE ANY ENGINEERING JOB, WE DESIGN . . .

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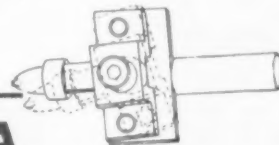
## Golconda POLYPOINT 3's FOR HIGHEST EFFICIENCY AND LOW COST CYLINDRICAL AND SURFACE GRINDING

**DESIGN**—The three diamond "all in line" horizontal working position against the wheel causes all three diamonds to work simultaneously giving group resistance to wear and assuring better gauge maintenance over entire face of wheel.

**NO RESETTING**—Correct tilting of the tool brings new, sharp cutting edges into service. The matrix holds the diamonds until they are all used up. This advantage plus the lower original price per tool results in LOWER COST PER DRESSING!

**SWIVEL FIXTURE**—Assures perfect alignment of diamonds at all times. Provides quick change to present new sharp cutting edges as exposed parts wear flat.

WRITE for literature on  
7 diamond POLYPOINT,  
SINGLE POINT and  
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**GOLCONDA**  
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and beautifully produced "Production Plus".

This consists of natural color movies, followed by Kodachrome slides detailing the same operation, of interesting production operations carried out on milling machines here and there.

Most interesting, perhaps, was a method of slotting sixty-four round nuts on the top face at once, with eight slitting cutters, holding the work pieces against the underside of the fixture by Neoprene pegs.

Other details shown were the milling

of eight faces at once on top, sides, and under shoulders of small lathe beds at eighty r.p.m. with a speed of ten and a half inches per minute; the governor cases for submarine diesel engines with a nine-inch diameter cutter at 74 r.p.m.,  $4\frac{1}{4}$ " per minute feed.

An item of vital importance Mr. Frommelt emphasized was that in face milling with cemented carbide cutters it was vitally important to have all the teeth in the same plane within .0002".

Speaking of the supply situation under present war conditions, Mr. From-

melt testified that the bottleneck in the United States is *not* machine tools, so much as fixtures.

Several questions were asked in the discussion which followed, particularly with a view to having details of the operations explained further, but offering suggestions at the same time as to improvements which might be made in the fixtures shown.

### Worcester

On January 12, the Worcester Chapter held its monthly meeting. This meeting was devoted entirely to an educational program and was arranged by Mr. Herman Libbey of the Heald Machine Company, who is Chairman of the Educational Committee of the Worcester Chapter. Before the technical session, election of a Nominating Committee was held and Mr. Ernest Walker and Mr. John Lippard were elected.

Mr. Herbert D. Hall, Newark, N. J. was the technical speaker of the evening, who gave a very interesting talk on emergency training, illustrated with slides and a motion picture. Mr. Hall explained how the training program of the A.S.T.E. has been adopted in some high schools and he also told about the work being carried on at the Wright Aeronautical Company, and also some of the work being done by the OPM in New Jersey.

Mr. Wat Cluverius, President of the Worcester Polytechnic Institute, was called on for a few remarks. Mr. Walter Dennen, who is head of the Worcester Boys' Trade School, gave some interesting facts on what they are doing for industry at the present time. Mr. Dennen stated that there would be available immediately a special course for high school seniors whereby they could stop in the Trade School every afternoon at 2:30 and have one hour of class work and then three hours of shop work, six days a week from now until June. In order to do this, they are shortening the lunch hour of their regular students and also eliminating one recess period so they will be out of school by 3:30. Mr. Dennen brought up the question of where his material could be obtained in the future, due to the Army calling upon boys of that age. He explained that they are now getting requests from men of the older age bracket, who have been employed in other lines, particularly Non-Defense, and that they would be drawn from this group in the near future.

The members were pleased to see Mr. Roger Heald of the Heald Machine Company and their former Chairman, Mr. Ray Cole, who also attended this meeting.

**Nearly 400 Engineers  
to loan you  
for today's emergency**

- to relieve your harassed personnel of some of its burdens
- to solve the perplexing problems now facing you
- to organize production schedules caused by the introduction of new and unfamiliar products
- to expedite the designing of necessary tools, dies, gages, fixtures, etc.
- to obtain emergency production with existing equipment

For these purposes, and many other types of assistance, this organization of experienced men can render the kind of service that is vital to making your performance most efficient.

*We invite discussions of  
your particular problems*

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AND MANUFACTURING CO.**  
**19645 JOHN R STREET  
DETROIT, MICHIGAN**

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In the Cleveland district, G. C. Beebe, District Sales Manager, and staff offer users the benefit of many years operating and field experience.

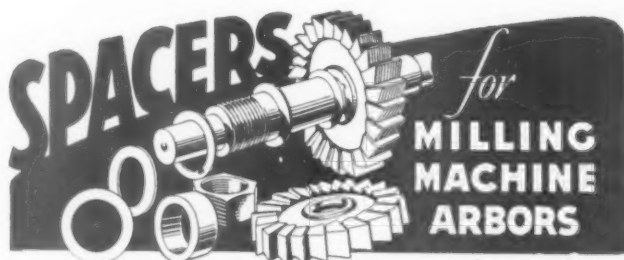
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## DE-STA-CO ARBOR SPACERS

They save time in setting up cutters on milling machines and other tools. Will help you get work out quicker. Low in cost, but high in savings. Made of metal and may be used over and over again. Standard stock sizes from .001" to .125" thick. Also specials up to 4.000".

## TRIAL ASSORTMENT

Enough spacers for average use on one machine, sent for \$1.00. Give arbor size when ordering.

Price list No. 75 sent free

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*Established Over 25 Years*  
356 Midland Ave • Detroit, Mich.

FEBRUARY, 1942

## SMOOTH, FAST MILLING OF S.A.E. 6145 Chrome Vanadium Steel



A Michigan manufacturer produces cams made of S. A. E. 6145 chrome vanadium steel which Rockwells between 38 and 42. In milling these cams, Putnam Hi-Speed End Mills have proved to have done a faster job of cutting and have had a considerably longer service life than any others which have been tried.

On your toughest jobs—or on those which are not unusual—you can be sure of excellent results when you select Putnam End Mills. It is for that reason that many of the country's best known manufacturers use them exclusively.

## PUTNAM TOOL COMPANY

2987 Charlevoix Ave. • Detroit, Michigan



Chicago Rawhide Mallets and Hammers are the best tools you can buy for protecting surfaces when they need to be pounded.

Genuine Java Water Buffalo Hide will not split, crack or break. The hydraulically compressed heads of Chicago Rawhide Mallets and Hammers are safe to use and safe to handle. Hammers have replaceable faces in malleable iron heads. These economical tools are made in sizes and weights for every purpose. You can get them through your dealer.

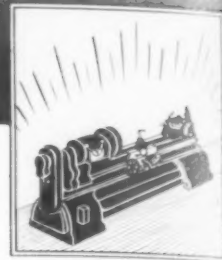
The next time you buy, ask for Chicago Rawhide tools.



**CHICAGO Rawhide MFG. CO.**  
1393 ELSTON AVE • CHICAGO • U.S.A.



# NEW EQUIPMENT, Materials, Processing



## TUFF-HARD PROCESS

(G6)

By means of the Tuff-Hard process, recently patented by the Tuff-Hard Corporation, Detroit, the range of all steels used for standard cutting performance is widened and particularly molybdenum steels are said to come nearer to being all-purpose tools than by any other process.

Due to the tenacious strength of the cutting edge, Tuff-Hard heated tools are claimed to make possible deeper cuts at fixed speeds or greater feeds with the same cut.

This process is available in the following three distinct types of service; as a service for the heat treatment of specially designed tools, as a service in supplying tool bits in various grades and standard square sizes, and as a service where, under a patent licensing arrangement, manufacturers can heat treat their own tools.

## BRADFORD "METALMASTER" GEARED HEAD LATHE

(G7)

Featuring twelve speeds in geometrical ratio with both forward and reverse directions, a new geared head lathe called the "Metalmaster" has just been announced by the Bradford Machine Tool Company, Cincinnati, Ohio.

The headstock of the lathe is said to be rugged, simple and exceptionally free from vibration. Heavy walls and a sturdy center bracing rib support all the short intermediate gear shafts in tapered roller bearings.

All gears are of nickel alloy steel, heat treated, and shaved and lapped to

close tolerances for smooth and quiet operation. The sliding gears are mounted on cylindrically ground splined shafts with integral cut splines.

Another important feature of the lathe is the spindle which is manufactured from high carbon molybdenum steel forgings that have first been bored from the solid stock straight through from end to end.

## LAKE ERIE HYDRAULIC PLATE BENDING PRESS

(G8)

A 400 ton hydraulic plate bending press, said to be especially adapted for ship building use, has been designed and built by the Lake Erie Engineering Corporation, Buffalo, New York.

The press is a self-contained machine with the pumping unit mounted on top. It has a 30 inch throat, 24 inch stroke, and 36 inch daylight opening.

It is claimed that the handling of work is eased by a gap type "C" frame which is made of steel for strength and rigidity.

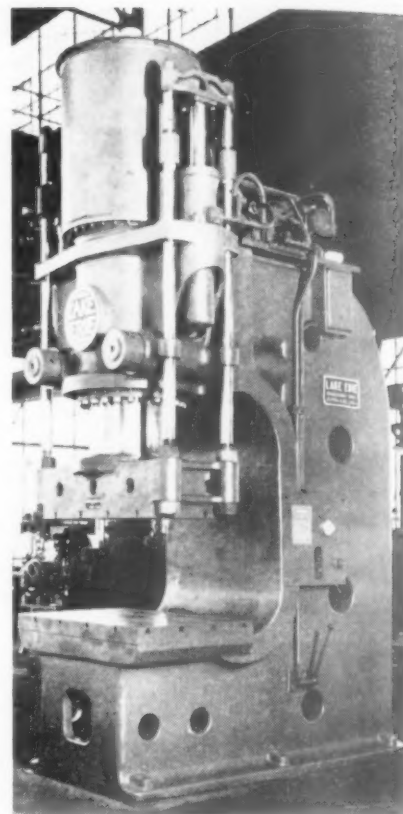
The sensitive control of pressure essential for bending operations is provided for by a conveniently located hand lever.

## FORGED TUNGSTEN CARBIDE TIPS

(G9)

To meet the critical demands of the Defense Program, research work over the past year has now made Forged Carbide available for industry, according to Luria Steel & Trading Corp., who have recently been appointed as exclusive distributors for Forged Carbides, Inc.

The product is a new type of tool tip



Lake Erie Hydraulic Press Adapted to ship building.

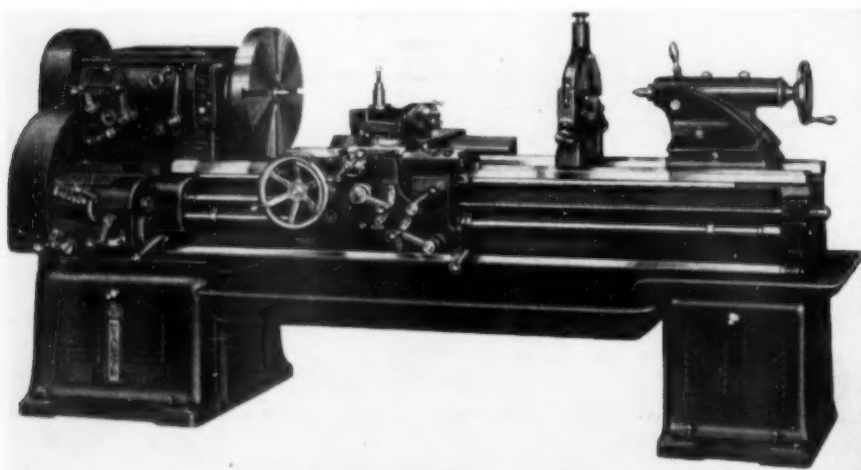
made from tungsten carbide and forged after sintering. It is claimed that forging increases the density of the metal 20 percent and therefore produces a tougher material with superior wearing qualities. This should insure longer tool life and fewer interruptions of production.

These tools have a hardness somewhere between that of a diamond and regular sintered carbide according to the maker. Only one grade of tungsten tool tip is required for iron, steel and non-ferrous metals. It can also be used for machining Bakelite and other synthetic resins.

Less breakage and chipping, are claimed for these forged tool tips and cratering is eliminated.

The tools are dry ground on medium Silicon-Carbide wheels. If possible, it is recommended, that the tool be finished on a Diamond lapping wheel.

Forged Carbide tips are brazed into shanks just the same as ordinary cemented carbides. The tool tips come in thirteen sizes, ranging from 3/16 to 1/2 inch thickness, 3/8 to 1/2 inch width and 1/2 to 1 inch length. Their weight ranges from 10.25 to 72.00 grams.



Features twelve speeds in geometrical ratio. Bradford Metalmaster Geared Head Lathe

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For your convenience, these three business reply cards enable you to request quickly...

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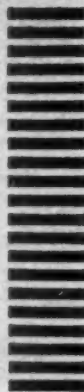
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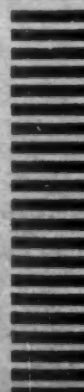
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## ANSWERING ADVERTISEMENTS

*Requesting:*

**LITERATURE  
REPRESENTATIVE  
TO CALL**



## GATCO HORIZONTAL (G10) CARBIDE AND DIAMOND BORER

To the well known line of vertical carbide and diamond borers, Giern & Anholtt Tool Co., Inc., have added a new model, the "D2" which is of the horizontal type. This unit is of the welded steel base construction. It has the characteristic Gatco rotating pilot bushings for supporting the boring bars.

The capacity of the borer is indicated by the following specifications: speeds, 392 to 1960 rpm; table travel 40 inches; table to spindle center, clearance, 9 inches; floor space 40 by 106 inches and the weight approximately 6000 pounds.

The pedestal is made from steel plates onto which a heavy cast steel bed is welded. Formed in this bed are the ways which support the table. One of them is prismatic, the other flat, to insure perfect alignment under all temperature and working conditions. The feed is hydraulic and utilizes a constant flow vane type of pump.

Not only do the pilot bushings rotate on anti-friction bearings but the spindle, of standard Gatco construction, is mounted on preloaded precision ball bearings.

The spindle is driven by a 3 hp 220 volt 60 cycle 3 phase 1500 rpm electric motor. The hydraulic pump motor is the same but runs at 1000 rpm. The drive from motor to machine is by vee type belts and the speed range is obtained from a selector directly connected to the electric motor.

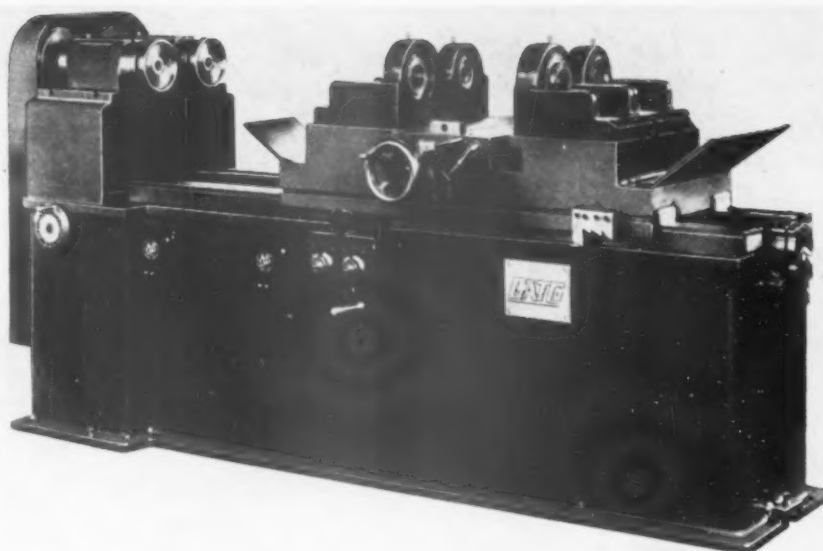
The spindle carries a No. 4 Morse taper. A cooling pump is an optional extra. The borer capacity depends upon the kind of material to be machined.

## POROUS IRON BEARINGS (G11)

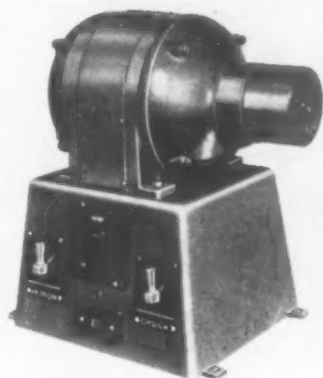
The addition of self-lubricating porous iron bearings to their standard line



Selflube porous iron bearings come in standard shapes.



Giern & Anholtt new type Horizontal Carbide and Diamond Borer with rotating type pilot bushings.



Lima Magnetic Polishing Lathe which has just been announced.

of bronze bushings has been announced by the Keystone Carbon Co., Inc.

Selflube porous iron bearings are made from powdered iron. This is molded to the shape and size desired and then baked. The finished bearing is then saturated in a good grade of oil. The porosity varies from 25 to 35 percent enabling the bearing to store a large amount of oil. In many applications this oil supply lasts for the life of the unit. This eliminates oil vents and grease cups. For heavy duty service, however, additional lubrication is recommended.

It is claimed that their low coefficient of friction prevents excessive temperatures, speed reduction, bearing noise and scoring of the shafts.

These porous bearings are molded to close dimensional tolerances so that no redesigning or special engineering is required in their application.

The standard shapes are shown in the illustration: (1) sleeve or plain cylindrical bearing; (2) washer or thrust type bearing; (3) spherical or self-aligning bearing, and (4) flanged type bear-

ing. Examples of special shapes are shown by bearings (5) and (6) in the illustration.

These bearings have been developed to conserve copper and represent years of research work in the company's laboratories.

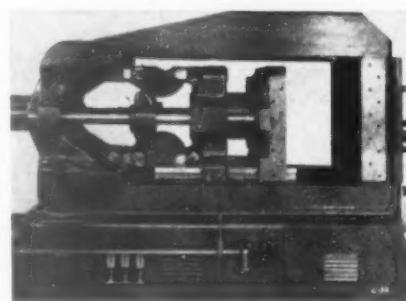
## LIMA MAGNETIC POLISHING LATHE (G12)

This unit made by the Lima Electric Motor Co., is designed to handle small steel parts that are difficult to handle in a regular chuck or collet. It will handle steel parts from 2 to 5 inches in diameter. Lathes are furnished in speeds from 600 to 3600 rpm with single and two speed motors optional.

## LESTER-PHOENIX DIE CASTING MACHINE (G13)

Built by the Phoenix Machine Company, 2701 Church Avenue, Cleveland, this new die casting machine is said to be very efficient in the production of aluminum, brass, and magnesium die castings for aircrafts. X-ray rejections on thousands of castings have been less than one per cent.

Density is achieved by high injection pressure (22,000 psi) sustained throughout the injection stroke. This



New Lester-Phoenix die casting machine for aircraft parts.

pressure, created by a self-contained hydraulic system, is confined within the die by a die "squeeze" of 400 tons.

Electric timers provide exact repetition of any selected casting cycle.

### WALKER-TURNER (G14) 20" POWER FEED DRILL PRESS

A drill press that will be available for power feed, hand feed or foot feed applications is being manufactured by the Walker-Turner Co., Inc., Plainfield, N. J. Because of the improved design and

the exceptionally rugged construction, it is claimed to be an ideal production machine.

One of the outstanding features is the power feed unit—a built-in clutch which is part of the worm drive and is said to assure smooth, positive action at all points of spindle travel.

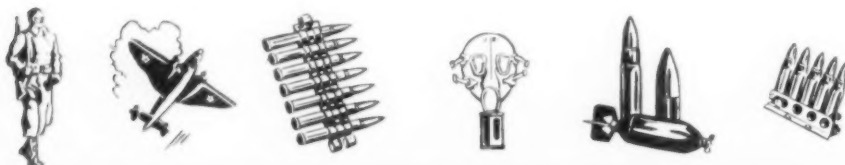
In keeping with the accepted practice, the unit is powered from the drill press spindle. Four rates of speed are provided for each of the five spindle speeds and an easily read chart indicates the rate of feed in thousandths of an inch

per revolution of spindle. This range will handle efficiently all drilling and reaming operations in cast-iron from 1 inch down to 1/16 inch.

The machine is equipped with a No. 2 Morse Taper spindle nose and is available in single spindle or 4 spindle models.

### WICKMAN (G15) AUTOMATIC

Known as the Wickman High Speed Precision Automatic, a new Swiss type automatic machine has just been introduced by the Wickman Corporation, 15533 Woodrow Wilson Avenue, Detroit.



## EXPERIENCED COUNSEL ON MUNITIONS STAMPINGS

Dieing Machines are making intricate munitions stampings **COMPLETE** per stroke at high rates

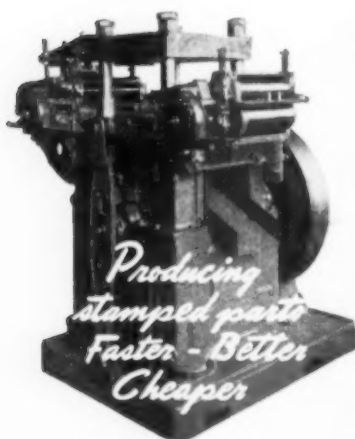
The unique Dieing Machine offers an unmatched combination of high production and high precision (accuracy of product to .0002" when necessary). Enjoy the benefits of our wide experience on such munitions items as—

Machine Gun Belt Links  
Time and Contact Fuse  
Parts  
Cartridge Clips  
Gas Mask Stampings  
Rifle Components  
Defonator Parts

Shell and Bomb Stampings  
Ammunition Parts  
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Primer Inserting and Bullet Assembly Operations

REQUEST CATALOG 42

**THE HENRY & WRIGHT MFG. CO.**  
441 Windsor St. Hartford, Conn.

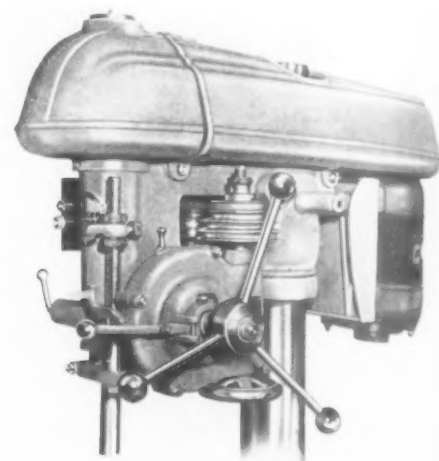


Machine gun belt link produced complete one per stroke, 140 per minute.



Airplane strut seat of .031" brass produced complete one per stroke, 140 per minute.

## HENRY & WRIGHT DIEING MACHINES

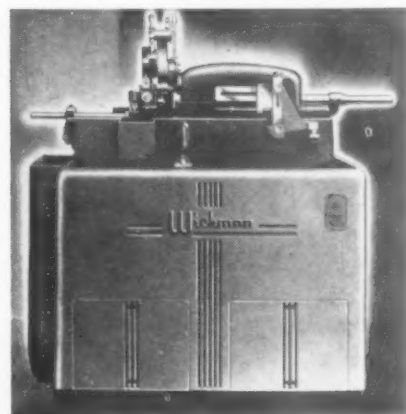


Walker-Turner Drill Press  
Has built-in clutch.

It is designed and built for use on a wide variety of work and is said to be particularly adaptable to the production of pinions, shafts, and long slender parts used in the manufacture of clocks, meters, and precision instruments for aircraft, radio, and other fields.

In armament work, it has proved extremely efficient in producing striker pins, detonators, and pinions for fuses.

Its principal features are the sliding headstock and the tool head carrying



Wickman Automatic  
New Swiss-type machine.

THE TOOL ENGINEER

## NEW WILTON PRECISION VISE



*Streamlined*

### IN APPEARANCE AND PERFORMANCE

The ideal vise for every factory and tool shop. It is built on new principles which guarantee greater efficiency and higher quality.

The WILTON VISE is practically indestructible—it is sold with a years unrestricted guarantee at a moderate price.

Used by various defense plants, such as International Harvester, Buick Aviation, Atlas Powder Corp., War Department and others.

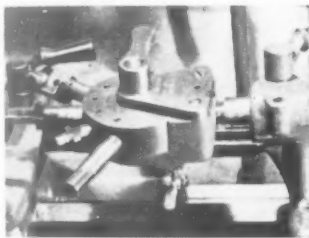
WRITE FOR FOLDER AND PRICES

### WILTON TOOL CORPORATION

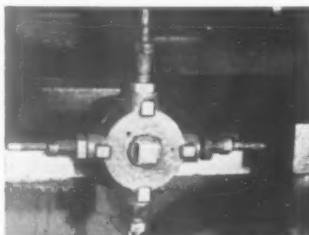
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## WHY NOT JOIN THE FRONT RANKS OF PRODUCTION



QUADRUPLEX TAILSTOCK TURRET  
\$15.00 F.O.B. BLOOMFIELD, N. J.



QUADRUPLEX LATHE STOP  
\$15.00 F.O.B. BLOOMFIELD, N. J.

THE ultimate of efficiency is doing even the smallest job in the least amount of time yet doing it well. A multiple operation QUADRUPLEX TAILSTOCK TURRET head eliminates that small run nuisance by doing on an engine lathe what would ordinarily be done in a tool room or on a turret lathe with a costly set-up. A four position micrometer set QUADRUPLEX LATHE STOP, by a mere flip of the finger, gives you accurate distances for work being done with the compound.

*An inquiry today will save time and money tomorrow.*

*Immediate delivery from stock.*

### SPECIALTIES MANUFACTURING COMPANY, INC.

Dept. T-1

Bloomfield, N. J.

FEBRUARY, 1942

## MAGNETIC CHUCK USERS SAVE MONEY

WITH

# NEUTROL

NEW BULLETIN NO. 21

Gives Full Information



NeuTrol provides quick release of the work piece from the chuck—demagnetizes the work as it releases it.

NeuTrol eliminates "hammer and pry". Just turn the power "Off" and you can pick up the work piece in a few seconds. NeuTrol eliminates waste time—saves the chuck—eliminates injury to the operator. NeuTrol can be easily installed on grinding machines now in operation—or on new grinders by grinding machine manufacturers.

Two types: Motor Controlled for Remote Control—and Manual Controlled for small units. "There's a NeuTrol for every size of chuck."

Write for Complete Information

### ELECTRO-MATIC PRODUCTS CO.

2235-37 NORTH KNOX AVE.

CHICAGO, ILL.

## U. S. Inspectors of Armament Production

## TAFT-PEIRCE THREAD GAGES



YEARS AGO, the first educational shell orders called up for service the Taft-Peirce line of Thread Gages. Since then, the Taft-Peirce Thread Gage Department has doubled, redoubled—now reaches a size where it has had to be moved into a

six-story plant of its own, adjacent to the main plant.

Here, production shifts into higher speed than ever, assuring prompt service on the complete Taft-Peirce Thread Gage line, which includes all AGD Standards and many special types. This line is shown in the Taft-Peirce Handbook. A line on your letterhead brings a copy to your desk.

**The Taft-Peirce Mfg. Co., Woonsocket, R. I.**



five tools which work radially. Only single point tools are used and all tools are provided with micrometer adjustments in both directions.

Finish, accuracy, and concentricity of work is maintained by a guide bushing in the tool head. The work is fed through the tools by the headstock.

### FRAY OFFSET BORING HEAD (G16)

As an addition to their line of "Standard" offset heads, a "Junior" model of



Fray Offset Boring Head  
A junior model.

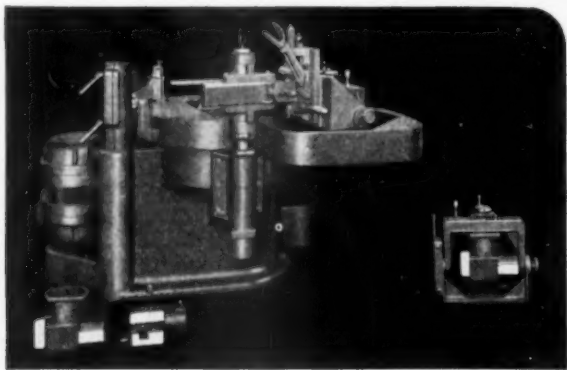
a size and design to be useful to tool-makers has just been announced by the Fray Machine Tool Company, Glendale, California.

A special feature of the design is the retaining ring over the complete assembly, which assists in carrying the load thrown on the tool carrying block, and helps exclude chips from the micrometer mechanism. Use of this retaining ring makes possible the round type of construction without the usual unsafe features of this design.

With an overall head length of  $1\frac{5}{8}$  inches and offsets  $5/16$  inches, this model has a 2 inch body diameter with a micrometer dial which has 50 divisions of .001 inch each. The shank is  $1/2$  inch in diameter, straight, and there are three  $3/8$  inch receptacles for boring bars.

## GARDNER-GRINDING

*two surfaces in one cycle*



on a  
36"  
HORIZONTAL  
MACHINE!

**H**OW two flat surfaces on 2-ton trailer housings, are ground in one cycle and held square with each other, is one of the many interesting production stories encountered today as the Defense Program is rapidly being expanded.

These malleable iron vertical support housings are surfaced on a Gardner No. 186 — 36" Horizontal Disc Grinder.

They are held in an indexing fixture mounted on a Hand-Operated Swinging Work Table, which is oscillated across the face of a 36" heavy-duty Gardner WIRE-LOK Abrasive Wheel. One surface is ground in 50 to 60 seconds; then the fixture is quickly indexed and the other face ground at right angles to the first, square within .002" to .003". The flatness tolerance is .003".

PRODUCTION: 30 to 40 SURFACES per hour.

*This NEW machine is amazingly versatile — it will handle dozens of flat surfacing operations, both free-hand, and fixtured.*

GARDNER-GRIND  
YOUR Flat SURFACES

WRITE FOR BULLETIN 702

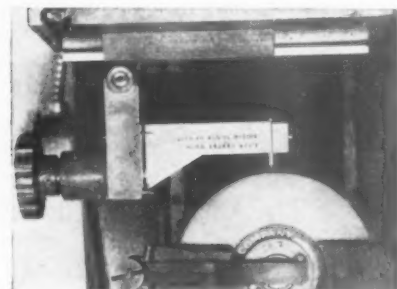
## GARDNER MACHINE COMPANY

442 East Gardner Street • • • Beloit, Wisconsin, U.S.A.



### SCHULTZ, ANDERSON (G17) RADIUS DRESSER

A radius dresser for surface grinding machines, called the C-66, has been announced by the Schultz & Anderson Co., 176A Ferry St., Newark, N. J. Besides dressing grinding wheels for different radii, the C-66 can also be used for correctly dressing wheels for radii where a clearance angle on the radius is involved.



Schultz, Anderson Radius Dresser  
Has special hood.

It is claimed that this dresser can be set up easily and quickly because of a hood that is set up in the arm of the dresser. For example, in dressing a wheel for a 0.250 inch female radius, the hood is elevated to such a position that its underside is 0.250 inch above the center line of the spindle. A set screw in the arm of the dresser then locks the hood in position. The diamond nib is then brought in contact with the underside of the hood and locked, the hood is removed, and the dresser is in readiness.

Also, settings are provided for in the hinge plate which can be pushed out to permit only the 90 or 180 deg. rotation that is frequently necessary to dress a wheel.

## CAMSHAFTS UP TO 54" LONG



Checked  
With The  
**VINCO**  
CAM  
COMPARATOR

Used With The

**VINCO**  
Optical  
Master  
Inspection  
DIVIDING  
HEAD

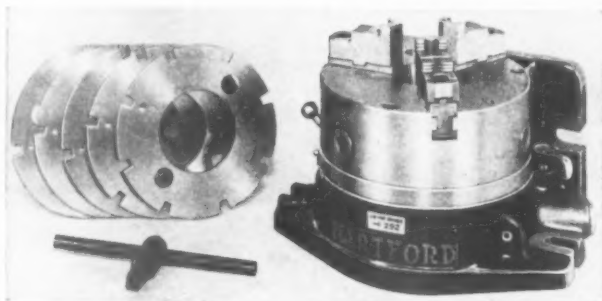
● The Vinco Cam Comparator is especially designed for use with the Vinco Dividing Head. It provides the means to secure an extremely accurate check of the amount of rise and fall and angular relation of cams on automotive or aviation camshafts. Camshafts up to 54" long can be checked.

The Dividing Head, used individually, is unexcelled for final checking of spacing, angular location or similar characteristics of gear teeth, master index plates, splines, etc. Write for full details.

**VINCO Corporation**

9115 SCHAEFER HIGHWAY DETROIT, MICHIGAN

## YOUR MACHINE *plus* THIS HARTFORD "SUPER-SPACER"



*equals* **GREATER, FASTER  
MORE ACCURATE PRODUCTION!**

Yes sir, Mr. Tool Engineer, the HARTFORD "SUPER-SPACER" insures the Super Production so necessary in American Industry today! This Cost-Cutting tool will be a valuable asset to your plant—especially because it is so very accurate that even unskilled operators can produce exact machining!

WRITE, TODAY, FOR FURTHER INFORMATION ON THE "SUPER-SPACER"

**THE HARTFORD SPECIAL MACHINERY CO.**  
HARTFORD, CONN.

FEBRUARY, 1942

## INSPECTION STAMPING WITH CODE SYMBOLS

### "Safe-Hed" STEEL STAMPS

Inspection stamps are a "must" for every coding purpose in the Defense Program. Symbols denote responsibility, inspection, or special coding of products. Workmen become more proficient when the responsibility is fixed.



#### WE HAVE HUNDREDS OF SYMBOL DESIGNS

We have hundreds of stock symbols. Write for full information about the many ways symbols can be used in your plant.

#### STOCK SYMBOLS TO MEET YOUR INCREASED DEMANDS

Symbol designs can be supplied with letters or figures as shown right. Made in special designs, if desired. Write now.

①	②	③	④	to	⑨
①	②	③	④	to	⑨
△	△	△	△	to	△
A	B	C	D	to	Z



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## THE REID No. 2-A AUTOMATIC FEED SURFACE GRINDER

DESIGN—Mechanical and Hand Feeds with a reciprocating table and horizontal spindle.

CAPACITY—The No. 2-A Surface Grinder grinds work 18" long, 6" wide and 11½" high, using a wheel 7" in diameter.

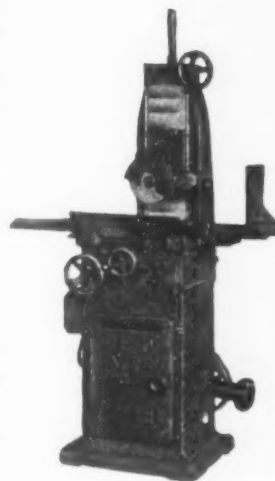
SPINDLE—High-grade heat-treated Chrome Molybdenum Steel; runs in phosphor-bronze boxes. Vertical adjustments are obtained by a hand wheel graduated to .0005".

WORK TABLE—Automatic in both directions and is controlled by dogs operating against a reverse lever.

MOTOR DRIVE—Machine requires a 1½ HP, 1800 RPM Motor. Motor is entirely enclosed in base of machine.

Good deliveries if priorities are attached to orders.

FLOOR SPACE—65"x30".



Exclusive Selling Agents

**H. LEACH MACHINERY CO.**

387 Charles St.

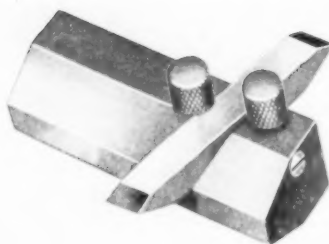
Providence, R. I.

Send for Circular to Dept. O.  
Distributors in all leading Cities.

**NEW ACRO  
HOLDER GAUGE****(G18)**

Said to position thread cutting tools at the proper angle while being ground on any type of surface grinder, a new master gauge has been announced by the Acro Tool and Die Works, 2815 West Montrose Avenue, Chicago.

Consisting of a one-piece hardened steel base milled slotted to position, it is said to hold thread cutting tools at the proper angles on the grinding sur-



**Acro Holder Gauge**  
Holds at proper angles.

face as required for standard thread cutting operations. The tool bit is held down tightly within the slot by two knurled head screws.

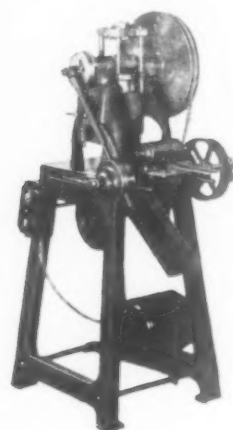
It is claimed that the new gauge departs from conventional units in that continuous testing is eliminated. Moreover, because grinding operations are limited to fixed angles, uniformity avoids regrinding to account for savings of tool steel.

**DIEBEL HI-SPEED  
AUTOMATIC PRESS****(G19)**

Developed by the Diebel Die and Manufacturing Company, Chicago, this "hi-speed," automatic press is said to meet the demand for a small but rigidly built punch press to handle small stampings of metal, fibre, or similar material.

The Diebel Press has speeds from 180 to 500 strokes per minute. It has a built-in feeding mechanism and handles strip or coil stock equally well.

In addition to the high production speed, it is claimed that the press also has shown savings in die maintenance cost because of its construction, which assures perfect die lineup.



**Diebel Press**  
Has built-in feeding mechanism.

*Orders Piling Up*  
**WAITING FOR DELIVERY  
OF NEW MACHINE TOOLS?**

Get More Production  
**NOW — with  
TECO  
CARBIDE  
TOOLS**

Tool up with **TECO CARBIDE TOOLS** and you'll discover reserve capacity in the machines you now have. This reserve can be tapped to get orders out of your plant faster. **TECO CARBIDE TOOLS** are setting records for turning, boring and facing the toughest metals—both ferrous and non-ferrous. Their accurate, high speed cutting and much

longer runs between grinds are increasing capacity-per-machine in Defense plants everywhere. They can do the same in **YOUR** shop!

**TECO CARBIDE TOOLS**, in grades and styles for practically every machining need, are available for prompt shipment on Defense orders. Tell us your needs.

• **TECO CARBIDE TIPS FOR IMMEDIATE SHIPMENT.** Standard grades, styles and sizes

**TUNGSTEN ELECTRIC CORPORATION**

370 39th Street

Union City, N. J.

Branch Office: 2906 Euclid Avenue, Cleveland, Ohio

Pioneers in Tungsten Carbides for Over a Quarter Century

**CUNNINGHAM  
HAND TOOL HOLDER****(G20)**

A completely new device which is made to hold square or octagon shaped tools such as steel hand stamps, chisels, and other similar hand tools has just been announced by the M. E. Cunningham Company, 169 East Carson Street, Pittsburgh.

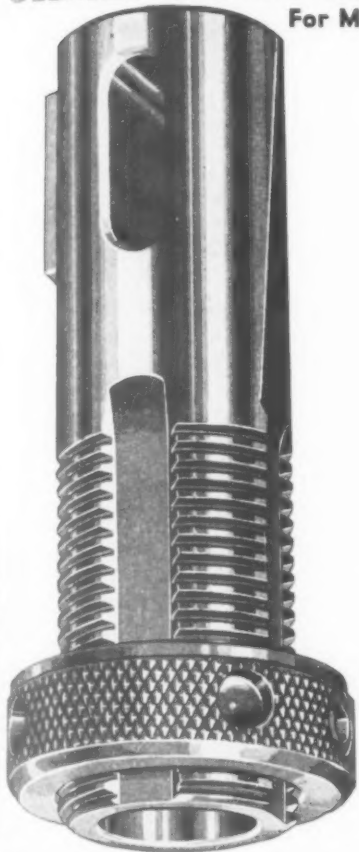
This new Safety Adjustable Hand Tool Holder can handle any size piece from  $\frac{1}{4}$  inch to  $\frac{3}{4}$  inch and other  $\frac{1}{2}$  inch ranges up to  $1\frac{1}{4}$  inch square.

It provides a means for holding the different hand tools to eliminate the pos-

**THE TOOL ENGINEER**



## GLENZER ADJUSTABLE ADAPTERS For Multiple Spindles



STANDARD  
EQUIPMENT  
FOR ALL  
DRILLING  
REAMING  
AND TAPPING  
MACHINES.

ADOPTED AS  
STANDARD  
BY LEADING  
AUTOMOTIVE  
AND MACHINE  
TOOL  
MANUFACTURERS

**Utility  
Tools**

THE  
J. C. GLENZER  
COMPANY  
6463-6477  
Epworth Blvd.  
DETROIT  
MICHIGAN

## SIMPLIFIED INTERNAL GRINDING with the MAJESTIC INTERNAL GRINDER

An exceptionally wide range of internal grinding jobs can be handled on the New Majestic Internal Grinder. Its simplicity of design and ease of operation are features of utmost importance in providing maximum grinding output at low cost.

### SPECIFICATIONS

Length of table, 48". Swing over table, 10". Travel of cross slide, 2 1/2". Precision dial graduated to .0001". Precision bearing work head. Speeds—100, 225, 350 r.p.m.

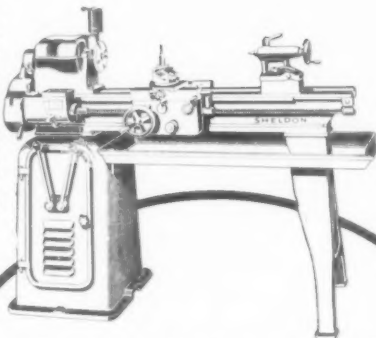
Write for complete details contained in New Bulletin



**Majestic Tool & Mfg. Co.**  
2950 E. Woodbridge  
Detroit, Mich.

## SHELDON

\*The Sheldon U-type Under-seat Motor Drive is a 4-speed V-belt drive, enclosed in the pedestal base leg. Speed changes are made instantaneously by external shift levers which operate clutches. Available with all Sheldon Lathes.



**Sheldon Lathe No. U-1236WQ**  
12 1/4" Swing, 36" Center Distance

This is a quality precision lathe with large special analysis steel spindle ground all over and 1" round collet capacity. Hand scraped Bronze Spindle bearings. (Also available with Ultra-Precision Ball or Super-Precision Roller spindle bearings). Full Quick-Change Gears. Double-walled Worm Feed Apron with Power Cross Feed. Heavy strutted and cross-braced semi-steel bed with hand scraped ways (2 V-ways and 2 flat ways) and U-type Lever-operated 4 speed Motor Drive.



**SHELDON MACHINE CO., Inc.**  
4252 No. Knox Ave., CHICAGO, U.S.A.

## DIAMONDS SET IN SINTERED TUNGSTEN CARBIDE

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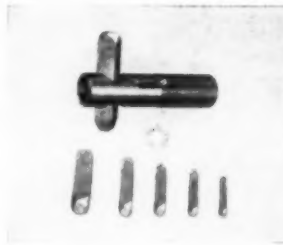


sibility of split or smashed fingers by foul hammer blows. It also holds the stamp or any other tool securely in the holder; thus there is no possibility of it flying out.

It is said to be possible to get a clearer and more even impression because stamps are held squarely in place.

Holder can be furnished with a lever on the front which protrudes at the proper angle to allow the operator to make several impressions in a line.

It is made from steel tubing which



**Cunningham Holder**  
No split or smashed fingers.

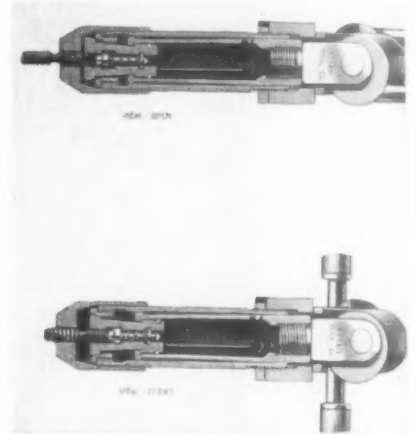
is slotted through in a "V" shape to provide for holding the tool. A special coil spring fits inside the tubing.

## TITAN STUD SETTER- (G21) MANUAL DRIVE

Said to be especially designed for aeronautical requirements in stud driving, the Victory Stud Setter-Manual Drive has just been announced by the Titan Tool Company, Fairview, Penn.

It is claimed that loading and releasing is done so quickly as to be almost instantaneous and positively eliminates the screwing on and off of the studs. The register between tool and studs is accomplished by a forward movement (thrust) of the stud driver.

The clamping is done by means of cams acting on a draw bar. The cams are part of the handle assembly. Reversing the position of the handles provides for the freeing of the tool and stud.



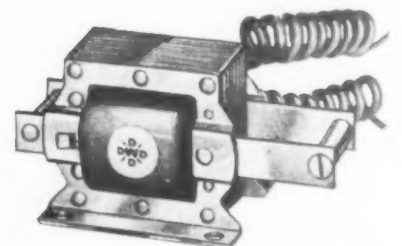
**Titan Stud Setter**  
Loading and releasing quick.

## DAVIS LAMINATED (G22) SOLENOID CONTROL

Advancement in compact design, with unusual sturdiness, is claimed by this new laminated type solenoid being manufactured by the Dean W. Davis & Company, Inc., 549 West Fulton Street, Chicago.

This new solenoid is said to meet the demand for rugged construction and positive reliability in the control of pro-

**Davis Solenoid Control**  
Features compact design.



**THE TOOL ENGINEER**

# New DoAll

## PRECISION GRINDER



**SUPREME  
ACCURACY**

**YEARS  
AHEAD  
IN  
PERFORMANCE**

**The new production tool that brings greater grinding accuracy than has ever been achieved before. Because of its weight, inbuilt motorized spindle and sturdy, all-around construction, vibration has been eliminated.**

**The DoAll has proved its worth under the most severe and grueling tests ever given a grinder and is presented as**

**TODAY'S GREATEST GRINDER VALUE**

Keep pace with the call for faster, smoother high precision grinding jobs. Ask for literature that will give you all the interesting facts about this modern grinder.

**SAVAGE TOOL COMPANY**

Dept. TE      Savage, Minn.

**6 REASONS WHY THIS GRINDER IS THE BEST**

- EXTRA WEIGHT**  
OVER ONE TON
- EXTRA BEARING AREA**  
827 Sq. In. of Bearings  
HAND SCRAPED
- DIRECT DRIVE**  
No Vibration
- MASSIVE COLUMN**  
" BALL BEARINGS IN SPINDLE ARE SUPER ACCURATE
- PROTECTIVE SADDLE**  
POWER HEAD RESTS ON A PILLAR OF STRENGTH
- MECHANISM IS FULLY SEALED**
- NEW HYDRAULIC DRIVE**

**ATTENTION  
DIE MAKERS!**



## PRODUCTO Master & Standard DIE SETS *delivered promptly*

Whether your need is in the East or the West, we can give you complete, quick service on Producto equipment.

Producto Die Sets are made in a wide variety of designs to meet the exacting demands of present day high production. There is one to fit exactly the die construction best suited to your stamping needs.

Write for Catalog No. 9

**THE PRODUCTO MACHINE CO.**  
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and  
3017 Medbury Ave., Detroit, Mich.

Also Die Supply Co., 1390 E. 30th St., Cleveland, Ohio. Pacific Coast users, contact Joseph C. Fletcher, San Francisco. Frey Industrial Supply Co., Los Angeles. General Tool Co., Portland, Ore.

DISTRIBUTORS OF DICKERMAN AUTOMATIC PRESS FEEDS



## SEALS ... LAPPED in PRODUCTION



*"Custom Tailored"*

**to your job!**

\*Acme Mechanized Lapping provides smooth, uniform, truly flat mating surfaces for rotating SEALS that are not only initially tight, but STAY tight indefinitely.

Your seal may be similar to any of hundreds already improved by the Acme precision-production method, which prevents the escape of fluids around rotating shafts, keeps out dust, grit and all foreign particles.

Large-scale users of seals find the Acme precision-production method even better than the most precise hand lapped work because it is uniform. This uniformity, insured by 100% inspection, cuts assembly costs by eliminating re-assembly and re-testing. Moreover, when the seal manufacture moves to the Acme plant, your skilled help is released for other important duties.

Send in your blueprint or complete seal for specific recommendations. No cost or obligation.

Acme Advice Is Yours for the Asking



**ACME INDUSTRIAL CO.**

Makers of Standardized Jig and Fixture Bushings  
208 N. Laflin St. MONroe 4122 Chicago, Ill.

## WHISTLER Adjustable Perforating Dies

CAN BE CHANGED AT WILL  
WITHOUT ADDITIONAL DIE EXPENSE

### OPERATES LIKE ANY SINGLE PURPOSE DIE

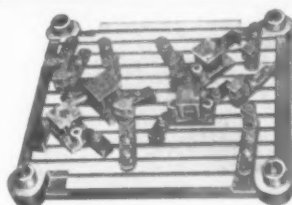
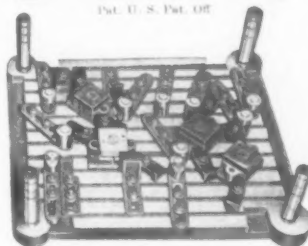


FIG. 11. S. FIG. 10.



#### The Perfect "Set-up" for PRECISION PERFORATING

Increase Production by saving days and weeks of single purpose die making. Whistler Adjustable Dies are ready to set up for immediate production—absolutely accurate on short or long runs.

Punches and Dies from stock— $1\frac{1}{8}$ " to  $1\frac{1}{2}$ ". Larger sizes on order. Minimum perforating centers of  $\frac{3}{8}$ ". Self cleaning. In use by country's largest manufacturers.

**S. B. WHISTLER  
& SONS, INC.**

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**FREE** Handy catalog, illustrating and explaining Whistler Adjustable Perforating Dies and other Whistler dies, tools and special machinery, yours on request.

## Better TAPPING at LESS COST

... made possible by Many Basic Improvements  
in Procunier Tapping Heads



A prominent Ohio manufacturer writes: "On checking with our factory, I find the PROCUNIER HIGH SPEED TAPPING HEAD WITH THE TRU-GRIP TAP HOLDER not only eliminates the necessity for using extension taps, but it reduces tap breakage... and enables our workmen to produce more and better work." Here's why: Tru-Grip tap holders weigh less than  $\frac{1}{3}$  the weight of conventional tap holders, and are more compact and accurate. Only Procunier High Speed Tapping Heads offer all these features: Dry, double-cone friction clutch that won't wear and can't absorb oil; makes bottom tapping easy; ball bearings; three point balance, heat-treated gear reversing mechanism, which distributes pull and greatly reduces strain—and other important features.

#### Send for BULLETIN

giving full details, description and prices on complete line of Procunier Precision Tapping Heads to meet all needs, the new True-Grip Tap Holder—and also the full line of Procunier Universal Tapping Machines, hand, foot or air-operated.

**PROCUNIER  
SAFETY CHUCK CO.**

12-18 S. CLINTON ST.  
CHICAGO, ILLINOIS

Send me bulletins on: ☐ High Speed Tapping Heads ☐ Tru-Grip Tap Holders ☐ Universal Tapping Machines.

Name.....

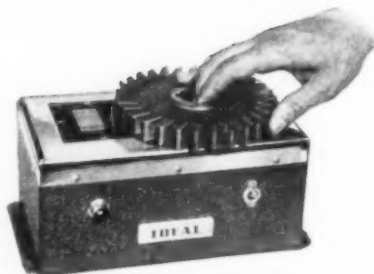
Address.....

City.....State.....



duction machinery or the operation of hydraulic valves. It is for constant or intermittent duty on alternating current, and is furnished with either push or pull type plungers. The field coil is specially treated to be impervious to cutting oils.

Obtainable for any voltage, this solenoid measures 2 x 2 inches with a plunger stroke of  $\frac{3}{4}$  inch. It has a minimum push or pull of 5.5 lbs. at full line voltage, and 3.75 lbs. at 85 per cent of line voltage.



**Ideal Demagnetizer**  
Abrasive particles easily removed.

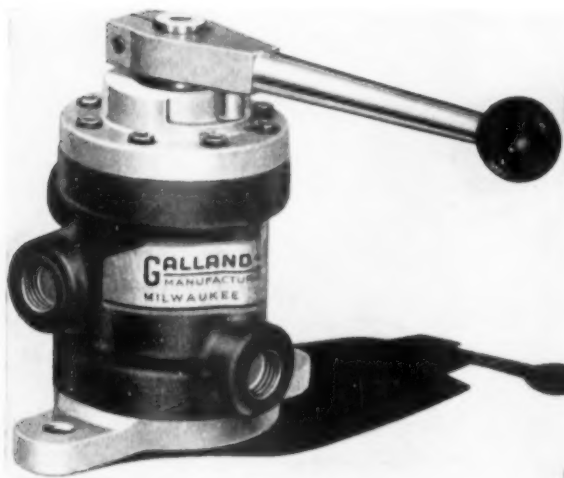
## NEW IDEAL DEMAGNETIZER

(G23)

Said to quickly demagnetize tools, drills, punches, dies, and work held in magnetic chucks, a new portable demagnetizer has been announced by the Ideal Commutator Dresser Co., 4152 Park Avenue, Sycamore, Illinois.

Abrasive particles such as metallic dust, flakes, or fine chips that can't be wiped off clean with a rag are easily removed after a single pass across the magnetic poles. And after the tool or part has been demagnetized, it can be laid on a bench or shelf without again attracting nearby metals.

Large parts can be demagnetized also, except that the Demagnetizer, which is light in weight and easy to handle, is moved over the bulky work.



**NOPAK HY-PRESSURE**, Balanced Hydraulic Operating Valve, available in 4 sizes, either by-pass or accumulator.

The NOPAK HY-PRESSURE Hydraulic control valve provides operating advantages never before available at hydraulic pressures over 500 pounds. . . . *It requires no more manual effort to operate than an automobile gear shift — even at pressures of 1,000 lbs. and more. . . . The hydraulic pressure inside of the valve is always balanced in all directions. As a result, the valve never gets "pressure-locked" in one position, to cause delays. . . . Easy manipulation speeds up production, eliminates operator's fatigue. . . . There is practically no pressure-drop between inlet and exhaust ports. Write for literature, now, on this important NOPAK development.*

**GALLAND-HENNING MFG. COMPANY**  
2757 S. 31st Street • Milwaukee, Wis.

# NOPAK

Representatives in Principal Cities

## VALVES and CYLINDERS

### DESIGNED for AIR or HYDRAULIC SERVICE

*It's  
New!*

**NOPAK  
HY-PRESSURE**

**Balanced  
Hydraulic  
Valve**

*... It's Easy to  
Operate*



**Only ONE  
Moving  
Part**

Only moving part in this HY-PRESSURE Valve is the spindle. . . . forged in one piece of nickel alloy, heat treated and hardened for strength and long life. Nothing to wear out or require maintenance.

## OSBORN WIRE END-BRUSH

(G24)

A tiny brush, no bigger than a finger, designed particularly for the aircraft industry but applicable to many other industries, has been developed by the Osborn Manufacturing Company, Cleveland.

Used to clean a small area from around rivet or bolt holes, this tool is said to have speeded up work and made it possible for one man to do the work previously requiring seven.

It is a tiny end-brush made of wire and incorporates a special pilot rod to fit into the hole. Tests prove that the brush does not clog.



**Osborn Brush**  
Designed for aircraft industry.

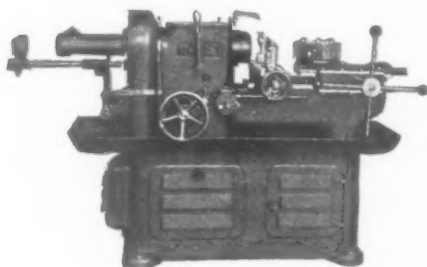
## GOLCONDA SWIVEL FIXTURE

(G25)

A swivel fixture has recently been developed by the Golconda Diamond Products Company, 2212 W. Armitage Avenue, Chicago, manufacturers of diamond tools, to be used with their square shank SINGLEPOINT tools.

This device is said to permit a far

**MOREY No. 2G & No. 3 Turret Lathes**  
**Motor Drive**  
**INFINITE SPINDLE SPEEDS**  
 Timken Taper Roller Bearings for Main Spindle  
 All Others Anti-Friction



	<b>No. 2G</b>	<b>No. 3</b>
SPEEDS from	90 to 1800 R.P.M. or 180 to 3600 R.P.M.	60 to 2100 R.P.M. or 100 to 3600 R.P.M.
CAPACITY	1"x6 1/2" turning length	1 1/2"x9" turning length Made in Plain and Universal Types

Ask for Bulletin No. 629    Ask for Bulletin No. 727

Any spindle speed you want—a direct reading dial shows when you've got it.  
 Permits the use of carbide tools for fast cutting.  
 Turret clamps and unclamps automatically.  
 Equally effective on second operation and chucking work.

**MOREY MACHINERY CO., INC.**  
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**UNIVERSAL**

**CENTERING CHUCKS AND FLOATING CHUCKS FOR SPEED AND ACCURACY**



Universal centering chucks (left) make a centering machine out of a drill press. Accurate and sturdy. Depth adjustment for centers.

Both centering and floating chucks available for speedy delivery. Write for catalog.



Universal floating chucks (right) are designed to operate horizontally in automatic screw machines and turret lathes. Adjustable spring pressure in 4 directions prevents dogtail motion and marred holes.

**UNIVERSAL ENGINEERING CO.**  
 FRANKENMUTH, MICHIGAN

FEBRUARY, 1942

Mark Iron,  
 Steel and  
 Carbides the

*Etchograph*

**Way**

2000 IN USE



NEW JUNIOR MODEL

**Buy the Original Electric Etcher**

Three sizes to meet all requirements. Also a combined Etchograph and Demagnetizer.

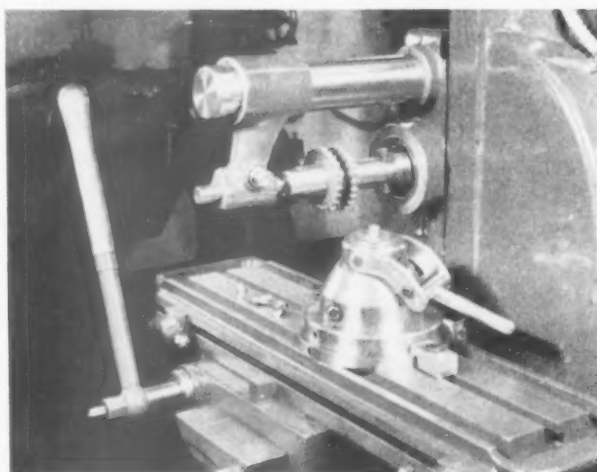
**With New ELKONITE TIP Pencil**

Mark hardened parts, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides — quickly — plainly.

Write for circulars and prices.

**BREWSTER-SQUIRES COMPANY**  
 54 Church Street  
 NEW YORK, N. Y.    U. S. A.

**NEW COLLET INDEX FIXTURE**



**FOR RAPID PRODUCTION ON SECOND OPERATION WORK...**

Mounts on face plates or tables and has wide application on milling machines, lathes, internal grinders, external grinders, drill presses, gear shapers and screw machines. Accuracy guaranteed. All parts hardened and ground.

Two sizes—1" and 2". Standard W. & S. Collets or can be furnished to fit customer's Collets.

Write For Complete Information

**ZAGAR TOOL, INC.**  
 23880 Lakeland Boulevard, Cleveland, Ohio

# On Guard



The Great Dane

## PROTECTION from DUST WITH TORIT DUST COLLECTORS

Dust-laden air is a menace to employee health and efficiency—a "saboteur" of vital machinery. Torit Dust Collectors "guard" against this condition.

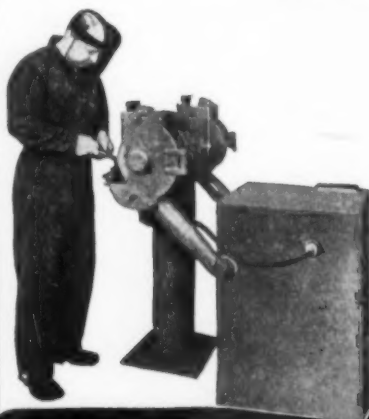
Torits are portable, self-contained units, easily installed near grinding wheels and other dust sources, — an important factor today, when many new machines are being added to industrial plants gearing for defense.

Send for Bulletin  
giving complete data,  
specifications, and prices.

**TORIT MANUFACTURING CO.**

281 Walnut St.

St. Paul Minnesota

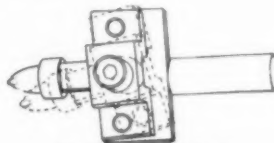


**TORIT**  
**Dust Collectors**  
SELF-CONTAINED UNITS

146

### —NEW EQUIPMENT—

greater tilting range than would be possible in many grinding machines. The tilting range, which is approximately 15 deg., permits an increase or decrease in drag angulation over the drag angle at which the dressing tool is received in the tool holder.

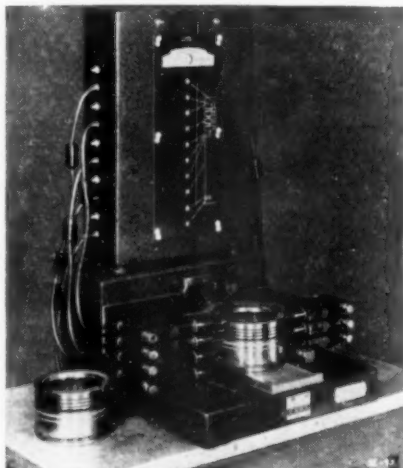


**Golconda Fixture**  
Permits a greater tilting range.

### SHEFFIELD MULTICHEK (G26)

The Sheffield Corporation of Dayton, Ohio, has just developed a Multichek for checking simultaneously ten dimensions of an aircraft piston. This gage is said to greatly increase the speed of piston inspection and has ten gaging heads.

Each of the gaging units operates independently and has its own signal light on the panel. The operator places the piston on the loading rails and pushes it between two guide anvils.



**Sheffield Multichek**  
Checks ten dimensions at once.

### NY-LINT (G27) GAP GAUGE GRINDER

A new gap gauge grinding machine which, in addition to use for grinding gap and snap gauges, can be applied to



**Ny-Lint Grinder**  
A variety of grinding services.

# LUFKIN

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The knurled base permits easier, surer handling. Readings are easier to take because of the Lufkin "Rapid Reading" system (each thousandth numbered). The patent lock nut maintains that reading, often preventing errors. The adjustable nut on rods allows you to permanently retain the tool's original accuracy. Range from 0 to 3 inches. See it at your dealers.

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TAPES • RULES • PRECISION TOOLS

THE TOOL ENGINEER



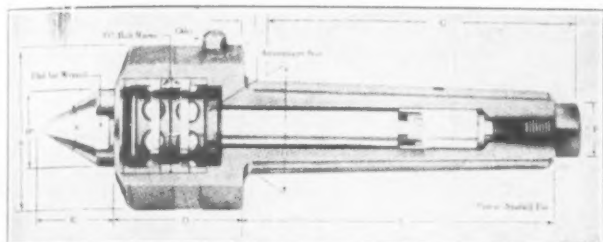
# The Improved Nielsen Live Centers

LOAD CAPACITY—200 TO 40,000 LBS.  
AT 100 RPM.

HAVE ADJUSTMENT TO TAKE UP WEAR  
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STANDARD MORSE TAPER No. 2 TO 6  
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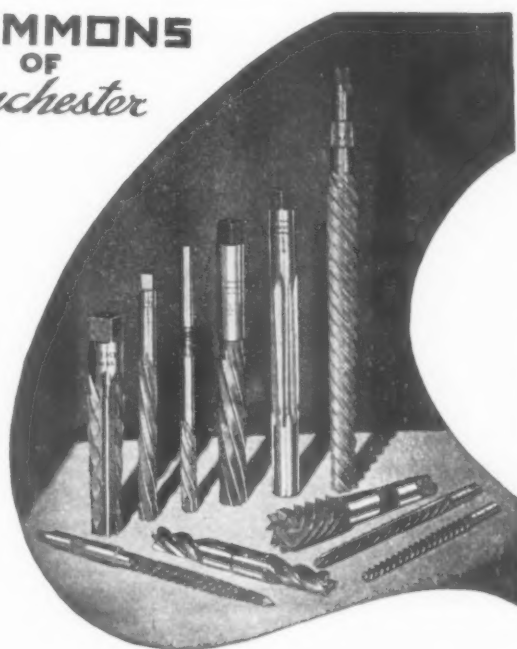
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### PRODUCTION TOOLS

ORIGINATORS AND  
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THE GAMMONS-HOAGLUND CO., MANCHESTER, CONN.

FEBRUARY, 1942

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Forgings For All Industries  
Rough Turned or Finished Complete



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Composite Die  
Sections  
Extrusion Tools  
Crankshaft Forgings  
Gear Forgings  
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•

Rings, Discs, Blocks,  
Shafts, Hubs, Bars,  
and Special Shapes.  
Tool Steel of all  
Makes

S.A.E. Specifications

STAINLESS & COPPER FORGINGS

May We Serve You?

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205 ADAIR STREET

DETROIT, MICHIGAN

*Longer Life at  
Increased Speeds give  
Increased Output!*

WITH

### RED-E-CENTERS



HIGH SPEED CENTERS.

- TOOL HOLDERS • GRINDER DOGS • BORING BARS
- BALL BEARING CENTERS • HIGH SPEED CENTERS

The RED-E center illustrated will outlast  
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speed steel end.

WRITE FOR CATALOG E-41

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# SPEED and PRECISION

TWO VITAL REQUIREMENTS  
OF WAR-TIME PRODUCTION  
are assured by using the



New Models  
SL and XL  
Designed for  
Heavy - Duty,  
Multi - Shift  
Work.

*Easy* RECIPROCATING  
ELECTRIC  
SANDER

Speed, combined with a strict adherence to close tolerances, is a "must" in today's program. Industry's leaders have proven

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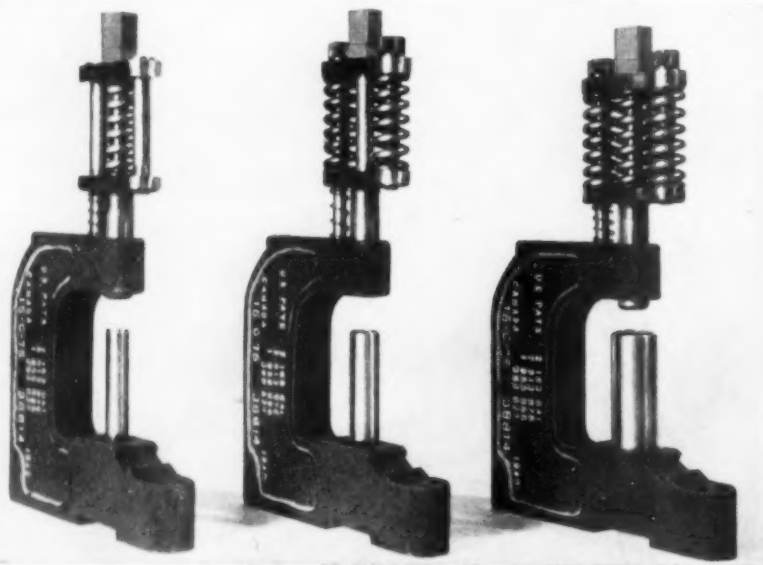
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Sanding "Alclad" Airplane parts before welding.

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For punching holes 1/16" to 5/16" diameter on 3/8" centers

Ever Hear of "Selective Stripping"? It's the Latest Innovation in

## WALES HOLE PUNCHING DIES

With it stripping pressure may be changed from light to heavy, to suit the work, instantly. Wales Dies are self-contained units. Nothing is attached to the ram of the press. Each individual unit may be reset or removed from the rail quickly. Free floating punches may be lifted out of their guides instantly. Even the punches, guides and springs may be removed from the holders instantly. Irregular patterns of holes not in straight line may be punched with standard Wales Dies and there is a large variety of all kinds to select from. There is always something new in the Wales Line. Keep posted by following our ads and writing to—

**THE STRIPPIT CORPORATION** BUFFALO, NEW YORK  
Specialists in Punching and Notching Equipment

## NEW EQUIPMENT

a variety of other grinding services, has just been announced by the Ny-Lint Tool Company, 1823 16th Avenue, Rockford, Illinois.

The double end spindle is of chrome nickel steel, the table is ground to a tolerance of .0001 inch and mounted on a cross slide with precision alignment. Longitudinal adjustment of the table is obtained with an accurate, hardened and ground precision screw.

### Washington Letter

(Continued from page 73)

with further change in the master preference rating list.

January 12—Priorities Regulation No. 3 issued effective February 2, form PD-1A to replace PD-1 (basic procedure to obtain a specific use priorities rating), and permitting a rating received on the new application procedure to be extended to suppliers and sub-suppliers for such materials as will be incorporated in the finished product without counter-signature by a Government officer.

Under the new regulation, PD-3A replaces PD-3, PD-4 and PD-5. Latter three ratings providing preference ratings for Army, Navy, foreign and United States government priority ratings. New rating is effective February 2 and in addition to being extendable without counter-signature of Army, Navy or Government officers, it also applies to equipment required to fill an order rated through PD-3A procedure.

January 13—Order M-18-a amended prohibiting melting of more than two tons of ferro-chrome in any one month without specific authorization of the Director of Priorities. Aimed at cutting off holders of lower brackets of priorities ratings from use of ferro-chrome.

January 15—Priorities Rating Order P-77, which assigns a rating of A-1-c to deliveries of specified list of materials required in rebuilding machine tools, extended to April 1, 1942.

January 17—Order M-65 and M-65-a —M-65 places cadmium under strict priority and inventory control. M-65-a prohibits processing and use of cadmium for listed civilian industry items, and restricts processing for all but direct defense needs.

Parallel to these priority control measures are Office of Price Administration requests to various producers of industrial machinery and portable power driven tools industries, as well as machine tool manufacturers, to stabilize prices. The general trend has been to use October price levels as the base for requests not to advance prices beyond those levels.

## Reclinable POWER PRESSES



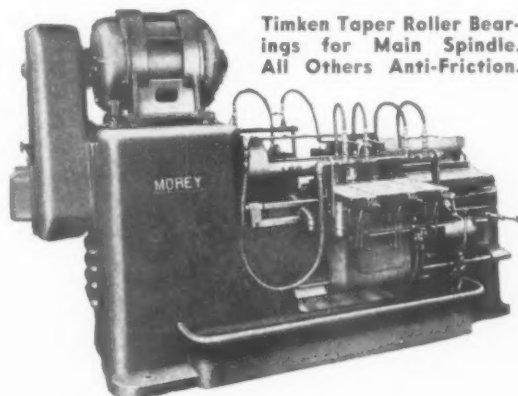
This press has long been considered the most suitable and favored type for general stamping work. Its features have been standard for a number of years, but many important improvements in details make the latest model outstanding. Its high performance is the result of thorough research, sound engineering and careful designing.

The Type 36 Press is available either plain or back geared, and the models range from 4 to 100 tons capacity.

Complete information on this and other Z & H presses will be sent on request.

**ZEH & HAHNEMANN CO.**  
192 VANDERPOOL STREET, NEWARK, N. J.

### MOREY "27" SHELL LATHE HEAVY-DUTY — SEMI-AUTOMATIC SUITABLE FOR 105 M.M. to 155 M.M. SHELLS



Timken Taper Roller Bearings for Main Spindle.  
All Others Anti-Friction.

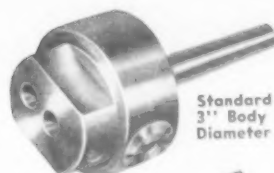
Just the Machine for Shell Work!

**Semi-Automatic:** A complete feeding and return cycle—A single movement of the starting lever starts the spindle revolving and the tools feeding. When the work is completed, the tool is returned to the loading position, the spindle is stopped and the work is unclamped, ready for removal. Rigid enough to use carbide tools to their full capacity. The Lathe is entirely self-contained—no outside or auxiliary equipment required.

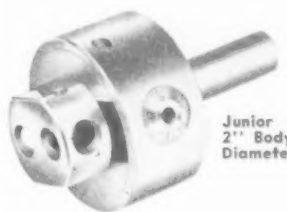
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410 Broome Street New York, N.Y.

FEBRUARY, 1942



Standard  
3" Body  
Diameter



Junior  
2" Body  
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Ready to Ship  
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The only Boring Heads with a retaining ring over the complete assembly. No sharp corners to catch on hands or clothing.

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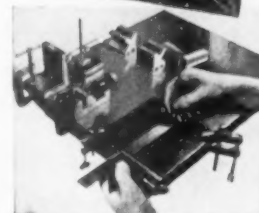
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No. 640—15"x18" at \$16.00;  
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Immediate delivery. Order from

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# NEW LITERATURE . . . . .

Of Interest to the Tool Engineer



## (343) Marking

*Skill in Machines.* The Acromark Corporation, 251-257 North Broad Street, Elizabeth, N. J. Marking methods are compared in this folder which shows how particular available machines, even though operated by unskilled labor, can do work ordinarily

allotted only to skilled men. It presents a solution to many problems of the costs of marking by old methods.

## (344) Compressed Air Use

*Industrial Products For Efficient Air Control.* 48 pp. A. Schrader's Son, 470 Vanderbilt Avenue, Brooklyn, N. Y.

This catalog is a handbook for production engineers to explain a new line of air operated machine controls. Emphasized are air ejection sets, toe and finger tip controls for operating machine clutches by compressed air and heavy duty air couplers.

## (345) Traction

*The Graham Dial.* 3 pp. Graham Transmissions, Inc., Milwaukee, Wisconsin. This monthly news digest contains current technical news, boiled down for quick reading by busy industrial executives. Included in the digest are brief articles on the specifications and advantages of Graham Variable Speed Transmissions and Metallic Traction.

## (346) Tool Tips

*New Standard Tool Tip Sizes and Price List.* 12 pp. Firth-Sterling Steel Company, McKeesport, Pa. This catalog completely lists all standard tool tips and their weight, size and price. Directions in the front of the catalog explain how the tips are sold. Several pages are also devoted to non-standard tips and their prices.

## (347) Grinders

*The New Roan Cutter and Tool Grinder.* 2 pp. Roan Mfg. Co., 1220 Washington Avenue, Racine, Wisconsin. This bulletin gives information on a new grinder for sharpening all types of metal working tools and contour and surface grinding. Complete specifications, sizes, fixtures and illustrations are given.

## (348) Dust Collector

*Stop Dust With the Dustkop.* 4 pp. Agat-Detroit Mfg. Co., 958 Book Building, Detroit. Compact, self-contained unit dust collectors are shown in this folder. Specifications of the unit, cut-away showing construction, together with illustrations indicating how the unit is located to collect dust from surface, tool pedestal and bench and cutter grinders are included.

## (349) Gages

*Thread Plug and Ring Gages.* 4 pp. Axelson Manufacturing Co., 6160 South Boyle Avenue, Los Angeles. This folder describes with illustrations the different kinds of Axelson gages and their uses. Illustrations also show these gages being made at the plant. The subject of gage classification is a topic mentioned.

Leadscrew nuts in Landmaco Threading Machine, product of Landis Machine Company, Waynesboro, Pa.



The designing engineers of American Industry—the men who are responsible for building longer life and greater production efficiency into top-rank equipment—are today putting Ampco Metal, that sturdy alloy of the aluminum bronze class, into vital operating parts. They know, through actual experience, that Ampco bronzes have high physical qualities that give many times ordinary service life.

## KEEP PRODUCTION LINES MOVING

The machine tool, ordnance, aircraft, heavy machinery, and other important war industries are employing Ampco Metal because of its stubborn resistance to wear, impact, and failure. It's the metal that performance-conscious designing

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Consult with Ampco field engineers for technical information—or write today for Catalog No. 22.

## AMPCO METAL, INC.

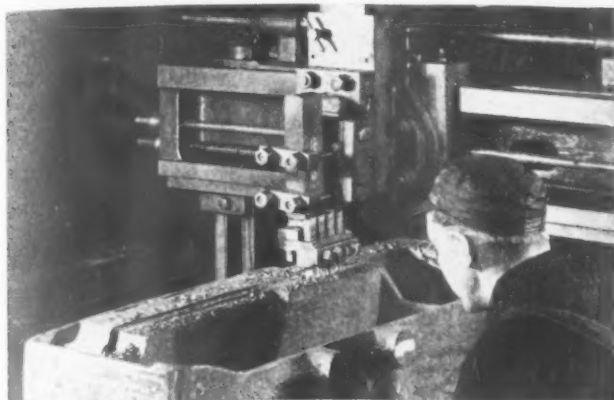
Department TE-2 Milwaukee, Wisconsin

### AMPCO LITERATURE Available

AMPCO METAL, catalogue 22  
Ampcoloy—Industrial Bronzes  
Catalogue  
Ampco-Trode Coated Aluminum  
Bronze Welding Rod  
Ampco Metal in Machine Tools  
Ampco Metal in Bushings and  
Bearings  
Ampco Metal in Dies  
Ampco Metal in Acid-Resistant  
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Castings  
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Ampco Metal in Gears



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## DO THE SAME WORK WITH 1/10 THE HIGH SPEED STEEL

Stop wasting critical High Speed Steel by using forged tools for that work that can be done more efficiently with ARMSTRONG TOOL HOLDERS. Each ounce of high speed steel in an ARMSTRONG TOOL HOLDER will do the work of 10 ounces in a bar tool. With single ARMSTRONG TOOL HOLDERS replacing complete sets of forged tools, the large amounts of high speed steel tied up in cumbersome single-purpose solid tools or wasted in heavy tool stumps can be saved.

ARMSTRONG TOOL HOLDERS are the most efficient tools obtainable, with correct cutting angles, maximum tool clearance, extreme rigidity and strength to stand up to any speed or feed. Use them for every operation on lathes, planers, slotters and shapers and for many operations on engine lathes, turret lathes and screw machines to "SAVE: All Forging, 70% Grinding and 90% High Speed Steel."



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"The Tool Holder People"  
360 N. Francisco Ave. Chicago, U. S. A.  
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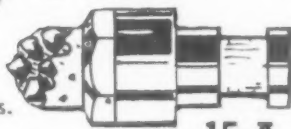
## SMITITE Diamond Tools for WHEEL DRESSING



20-A

*Dependable* IN OPERATION  
*Easy* TO ORDER

Contain  
finest quality  
Brazilian diamonds.



15-A

There is a tool for every grinding application, faultlessly crafted, efficient in operation. Each diamond is carefully selected for hardness, size, shape, and structure. The improved holding medium and the FORCED METHOD of mounting insure perfect application, low initial investment, and lower dressing costs.

J. K. SMIT & SONS, INC.  
157 Chambers Street, New York, N. Y.  
7 South Main St. Law and Finance Bldg.,  
West Hartford, Conn. Pittsburgh, Pa.  
Detroit — Chicago — Seattle

FEBRUARY, 1942

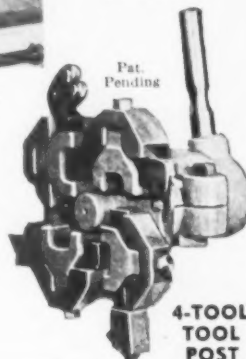
## SPEED-UP PRODUCTION— LOWER COSTS



Convert Your  
ENGINE LATHE  
into a  
TURRET LATHE  
in  
15 Seconds

Photo Shows Turrets on 16" Lathe

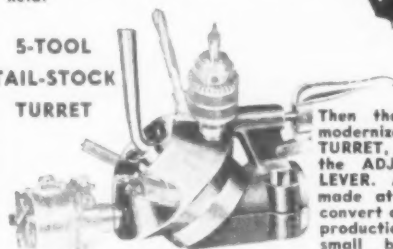
This new modern TOOL-POST TURRET, made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard made tool holders which can be easily inserted and rigidly held.



Pat.  
Pending

4-TOOL  
TOOL  
POST  
TURRET

5-TOOL  
TAIL-STOCK  
TURRET



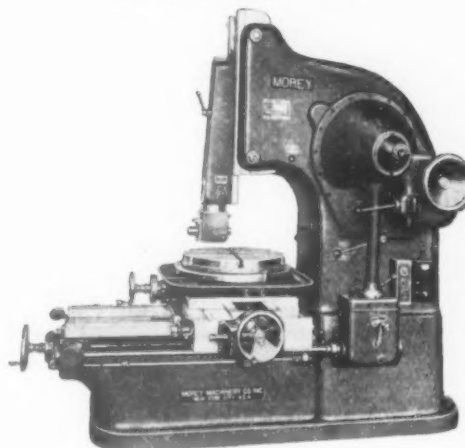
Then there's the completely modernized 5 Tool TAIL-STOCK TURRET, made in 4 sizes. Also the ADJUSTABLE PULL-FEED LEVER. All tools are precision made attachments which will convert any engine lathe into a production turret lathe. To fit small bench lathes up to lathes with 20" swing.

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JEFFERSON MACHINE TOOL CO.  
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Timken Taper Roller Bearings for Main Spindle  
All Others Anti-Friction



Built in two sizes  
8" stroke  
12" stroke

Accurate — simple for toolroom manufacturing. Self-contained motor drive.

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BETTER BORES**



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**COGSDILL PROCESS**  
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A READY REFERENCE  
Tells How to Operate  
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Screw and Milling Ma-  
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Presses and All Other  
Machine Tools.

A KEY TO SHOP PRACTICE  
In All Branches, For  
Every Machinist,  
Toolmaker, Machine  
Operator, Draughtsman,  
Metal Worker, Mechanic  
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Occupation .....  
Reference ..... T.E.

## —NEW LITERATURE—

### (350) Locknuts

*Palnut Locknuts.* 12 pp. The Palnut Company, 61 Cordier Street, Irvington, N. J. Illustrations show how the locknut works and its double locking action. Other pages of the booklet give the advantages of the device and how it may be used in industry. A chart is included which gives sizes and types and diagrams are given in detail on how to apply the locknut.

### (351) Sawing Attachments

*DoAll Attachments.* 6 pp. Continental Machines, Inc., 1301 Washington Avenue South, Minneapolis, Minn. Climaxing a five year study into the testing of various attachments which would meet production demands, this folder has been issued in which 21 basic attachments are listed, described, and illustrated. All attachments are for contour sawing machines.

### (352) Electric Motors

*Single Phase Direct-Current and Small Polyphase Motors.* 34 pp. Wagner Electric Corporation, St. Louis, Mo. This bulletin contains detailed descriptions of the construction of repulsion-start-induction motors, repulsion-induction motors, capacitor start motors, split-phase motors, direct-current motors, small polyphase motors, fan motors, and explosion-proof motors. Illustrations are found throughout the bulletin.

### (353) Portable Electric Tools

*Thor Portable Electric Tools.* 66 pp. Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago. Containing four major sections, this booklet gives complete descriptions, specifications, and prices on the entire Thor line of universal type electric drills, drill stands, screw drivers, nut setters, tappers, saws, hammers, nibblers, grinders, sanders, polishers, and electric tool accessories.

### (354) Die Springs

*Die Springs.* 4 pp. Muehlhausen Spring Corporation, Logansport, Indiana. Printed on heavy stock for convenient filing, all die spring information is presented in a condensed tabular style easy to understand. This bulletin illustrates, describes, and prices die springs for high speed presses, regular speed presses, and heavy duty presses.

### (355) Pumps

*Hand Pumps.* 4 pp. Watson-Stillman Company, Roselle, N. J. This bulletin describes hand operated, high pressure pumps for testing purposes and for operating hydraulic jacks and other small hydraulic tools. Ten different

## RUTHMAN GUSHER COOLANT PUMPS

**Uncle Sam says:  
"SPEED UP"**

Built-in motor, sturdy vertical shaft on ball-bearings, double suction intake giving balanced impeller . . . these and other famous time-saving Gusher features help SPEED your jobs.

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Model 2-P3

Speedier deliveries now, because of Ruthman's enlarged manufacturing facilities.

### Model P3

P3 models are available in external right or left discharge types, flange-mounted and immersed models.

Pat. and Pats. Pending.

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LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS



Round and round they go—millions of them—doing every conceivable kind of grinding and polishing job in machine, pattern and die shops, tool rooms, defense plants, foundries, etc.

Designed for rapid, smoother work wherever high-speed, portable grinders are used—these superior wheels of V/T Super Bond give 150% to 300% longer service, according to actual tests.

Chicago Mounted Wheels come in a wide variety of shapes, grains, grades and sizes.

### TRY ONE FREE

If you've never used Chicago Mounted Wheels, you might like to try a working sample. Write us the style grinder you use and size wheel desired. You'll be amazed at its performance, stamina and the way it holds its shape.

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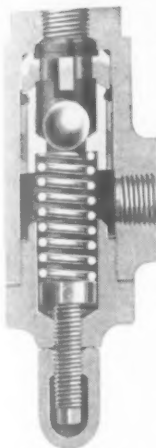
THE TOOL ENGINEER



FOR BETTER CONTROL OF

# Fluid Power Machines

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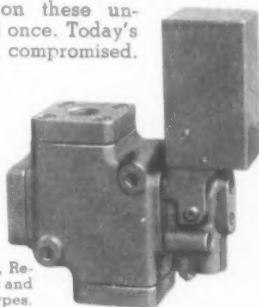


Oilgear Foot Valve... exclusive Oilgear Ball and Check design.



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BALDOR CARBIDE TOOL GRINDER is precision-built for accurately and quickly sharpening Carbide Tools. Sturdy 1/2 H.P. heavy duty, ball-bearing, reversible Motor. Large adjustable tool-rest tables. Satisfaction guaranteed.

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## T. H. L. FRONT LEVER BENCH PUNCH



Built for hard tough work — die cannot lose alignment with punch — all parts interchangeable.

Capacity 1/2" holes through 1/8" steel; 3/8" through 1/4" steel. Can also be made for holes up to 3/8" in thinner metal. Stock punches and dies available from 1/8" to 1/2" by 64ths.

Weight, 70 lbs.

**T. H. LEWTHWAITE  
MACHINE CO.**

(Est. 1890)

307 E. 47 St.

NEW YORK

PRICE WITH ONE  
PUNCH AND ONE  
DIE—

**\$50.00**

Immediate  
Shipment

## —NEW LITERATURE—

types of pumps are illustrated and construction features of each are described. Parts are tabulated for 19 different sizes of the pumps shown, and sizes carried in stock are indicated.

### (356) Bearings

*Ledaloyl Bronze Bushings, Bearings.* 36 pp. Johnson Bronze Co., New Castle, Pa. The main purpose in issuing this new catalog was that it would serve as a guide to designing engineers. More than 2000 sizes are listed, and methods of operation, control, and installation are illustrated and described. Chemical and physical characteristics and the value of lead are charted and explained.

### (357) Slotters

*Douglas Precision Slotter.* 8 pp. Douglas Machinery Co., Inc., 150 Broadway, New York. This bulletin not only describes in detail each part of the slotter, but also illustrates them. Specifications are charted for the different sizes of the machine.

### (358) Rebuilding

*The Simmons Way of Engineered Tool Rebuilding.* 58 pp. Simmons Machine Tool Corporation, North Broadway, Albany, New York. A trip through the Simmons plant with illustrations and description on how they rebuild machine tools is given by this booklet. The back part of the booklet is devoted to a catalog of Simmons milling machines and various lathes with their description and specifications.

### (359) Visepresses

*Studebaker Hydraulic Visepress.* 6 pp. Studebaker Machine Company, 9 South Clinton Street, Chicago. Application of the visepress for speeding up many operations in the shop are described and fully illustrated in this new folder. Features and specifications are listed.

### (360) Regulating Valves

*Hannifin Air Pressure Regulating Valve.* 4 pp. Hannifin Manufacturing Company, 621-631 South Kolmar Avenue, Chicago. This folder gives the dimensions, the advantages, and parts list of the valve. Illustrations are shown and cut models of the valve show clearly the mechanical works.

### (361) Machine Tool Drives

*Contributing to National Defense.* 4 pp. Cullman Wheel Company, 1344 Altgeld Street, Chicago. This folder describes machine tool drives that modernize old units. It gives a complete listing of drives for lathes, shapers, milling machines, punch presses, and automatic screw machines. The folder is illustrated.

## SAFETY WEDGE GRIP HOLDERS



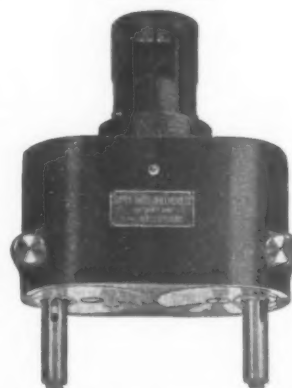
- No Spalling
- No Mushrooming
- Positive Grip
- Deeper Impressions
- 50% to 100% More Service! (Patented)

For marking airplane parts, rough and semi-finished shell forgings, gears, bars, and other machine parts. Can be furnished with any size and number of pieces. Patented Safety Snap provides quick change of Steel Type inserts.

Write for prices and complete information

**M. E. CUNNINGHAM CO.**  
169 E. Carson St. Pittsburgh, Pa.

## U S HEADS STANDARD SINCE 1915



30 DIFFERENT STANDARD SIZE  
ADJUSTABLE DRILL HEADS,  
CAPACITIES UP TO 1 1/2" DRILLS

SEND US YOUR B/PS

All Types of Fixed Center Heads

**UNITED STATES DRILL HEAD CO.**  
Cincinnati, Ohio

# Sellers 4T Tool Grinder



SEND FOR COPY OF 4T BULLETIN  
WILLIAM SELLERS & CO., INCORPORATED  
1626 HAMILTON STREET, PHILADELPHIA, PA.



# Sellers

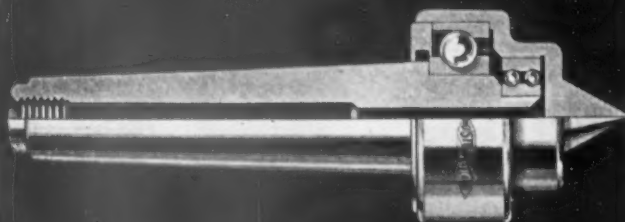
**I**F you are reading this advertisement, you are doing what nearly 18,000 other readers of The TOOL ENGINEER do every month. Each is anxious to learn of new developments, new tools, new ideas, new economies in mass manufacture.

**IT PAYS TO ADVERTISE IN  
THE TOOL ENGINEER**



# STURDIMATIC HEAVY DUTY LIVE CENTERS

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AUTOMATICALLY COMPENSATED FOR  
EXPANSION, SHOCK AND WEAR  
ARE ACCURATE, DURABLE

WRITE FOR CATALOG AND FREE TRIAL OFFER

**STURDIMATIC TOOL COMPANY**  
5218 THIRD AVE. DETROIT, MICH.



## IN DETROIT THE TRAVELER'S 1<sup>ST</sup> CHOICE

Seasoned travelers, when they visit Detroit, most always stop at the hotel that's "Aglow with Friendliness." They appreciate the extra value they get for every dollar they spend.

900 rooms with bath, circulating ice water and Servidor from \$2.50.

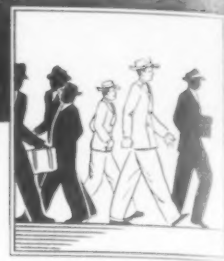
**HOTEL FORT SHELBY**  
*Aglow with Friendliness*

J. E. FRAWLEY, General Manager



# THE PASSING PARADE . . . . .

Promotions . . . Personals . . . Deaths . . .



The Wickman Corporation, Detroit announces the resignation as Sales Manager of **GEORGE EGLINTON** who is returning to his former position as Vice-President and General Manager of the Lincoln Park Tool and Gage Company. Mr. Eglinton's decision came as a result of the greatly increased demands put

upon the Lincoln Park organization by the new War Program.

The new Wickman Sales Manager is **T. B. (BERT) CARPENTER** who has been a prominent figure in the machine tool industry for many years. For the past seven years, he has been associated with the National Automatic Tool Com-

pany, Richmond, Indiana. During this period he was a Sales Engineer in Natco's Detroit and Chicago offices as well as spending some time in Paris, France as the company's European representative.

Mr. Carpenter is one of the best known members of the American Society of Tool Engineers. He was one of its founders and was on the Society's original Board of Directors. During 1933-34 he served as President of the A.S.T.E.

## How the Greater Hardness of KENNAMETAL

**INCREASES PRODUCTION  
REDUCES TOOL COSTS**

**T**HE Rockwell hardness of a tool material is not a complete indication of its ability to resist wear. A KENNAMETAL tool tip of the same Rockwell hardness as another carbide will actually machine more pieces per tool grind and last longer because of the greater hardness of the *individual particles* of tungsten-titanium carbide in the tip. This has been proven by comparative tests on jobs in production.

Here is what the greater hardness of KENNAMETAL means to users of turning, boring and facing tools for machining steel parts:

### Less Down Time for Replacing Dull Tools

Lathes and boring mills are kept productive during longer periods of time.

### Less Time for Grinding Tools

Eases the burden on men and machines in the grinding department.

### Less Tool Inventory

Fewer tools needed to replace dull tools and tools which have worn out.

### RECORD SALES PERMIT PRICE REDUCTIONS

Despite the fact that KENNAMETAL is harder, stronger, and more "crater-resisting" than other steel-cutting carbides, it costs no more. You need pay no extra to use the best. Write for Price List No. 7 containing new low prices on KENNAMETAL tools and blanks, effective Jan. 5, 1942. Do you have our Catalog No. 427



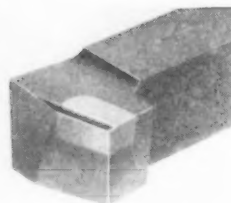
SALES REPRESENTATIVES FROM COAST TO COAST

## McKENNA METALS Co.

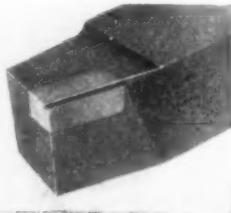
600 LLOYD AVE., LATROBE, PENNA.

Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York  
(Exclusive of Canada and Great Britain)

Canadian Agent: Kennametal Tools & Mfg. Co., 24 Dunbar Ave., Hamilton, Ont.



STYLE 21 TOOL



STYLE 11 TOOL



EGLINTON



CARPENTER

The Sundstrand Machine Tool Company, Rockford, Illinois announces the release of **A. M. JOHNSON** for the duration of the emergency in order for him to serve with the Office of Production Management at Washington, D. C. Mr. Johnson recently received an appointment to serve with the technical staff of this Government office, and will take over his duties on January 2nd. He is widely known in the machine tool industry, having been associated with it for nearly twenty years.

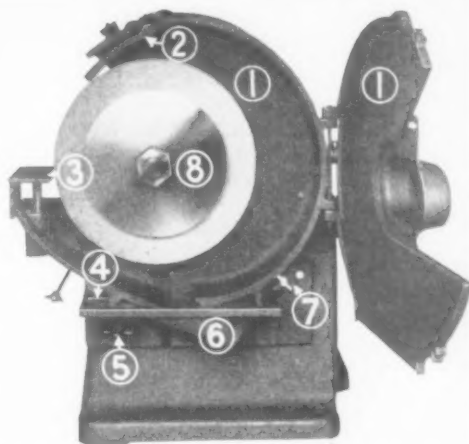


**A. M. JOHNSON**  
goes to Washington

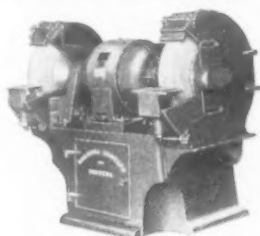
**THE TOOL ENGINEER**

### Details of MARSCHKE Automatic Wheel Guard

(1) Electric steel, one-piece construction. (2) Patented spark shield. Operator can't forget, for in adjusting (3) work rest to follow wheel wear, he moves guard and link, automatically adjusting spark lip to safest position. Guiding tongue of guard slides easily in (4) machined and fitted ways and is locked by means of (5) hand wheel. (6) Exhaust. (7) Guard plunger setting. (8) Note big wheel flange.



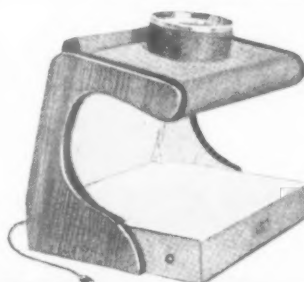
## MARSCHKE Floor Stand GRINDERS



• Automatic wheel guards are one of eighteen "tremendous trifles" that endow Marschke Constant Cutting Speed Floor Stand Grinders with their superior cutting efficiency and long dependable life. Massive spindles guarantee the true, smooth wheel rotation which, with correct speeds, add many hours of use to costly abrasive wheels.

• For rough grinding operations you certainly want what Marschkes offer! Seventy specifications of floor stand, swing frame and pedestal Marschke Grinders—from 1 to 25 HP—provide a machine for your every requirement. Compare them with others—write for the Marschke Catalog today.

THE MARSCHKE LINE • Vonnegut Moulder Corp., 1820 Madison, Indianapolis



## USE THIS INSPECTOGRAPH

FOR FINE AND ACCURATE WORK

FOR INSPECTION OF FINISHED PARTS

Today, more than ever before, contracts call for top accuracy. Let the INSPECTOGRAPH solve this problem for you! Regardless of the type of overhead lighting used in modern shops, it is impossible to eliminate shadows and glare. And here's where the INSPECTOGRAPH enters the picture—it has a soft, diffused fluorescent light, so inclosed as to be concentrated solely on the object, and a large lens to speed up inspection. It is 11½ inches wide, 12 inches high, 10 inches deep and has a lens diameter of 4 inches. Can be supplied in two models. Fully Guaranteed—Sold on 10 Days Free Trial.

Model A (Single Bulb) Net Price, \$22.40

Model B (Double Bulb) Net Price, \$26.40

**SCHULTZ & ANDERSON CO.**  
MACHINE TOOLS

176A FERRY ST.

NEWARK, N. J.

FEBRUARY, 1942

## 60-DAY JOB DONE IN 12 with

# DoAll BAND FILES



Webster - Brinkley Co., Seattle, Wash., Makers of Steering Engines for ships, filed 13,200 port openings in cast iron cylinder valves with DoAll Band Files in 1/5 former time.



### KEEPING UP with UNCLE SAM

A ship a day going down the way!  
That's the program for 1942.



37  
FILES  
LIKE  
THIS  
ON A  
STEEL  
TAPE  
MAKE  
ONE  
DoAll  
FILE  
BAND

DOALL BAND FILES fit into this production picture perfectly. They are 8 times as fast as hand filing, 5 times as fast as jig filing, saving millions of valuable man hours and speeding up finished production wherever filing and polishing are essential.

#### Wide Range of Sizes

DoAll Files come in 20 different styles, cuts and widths, to take care of anything from hard high carbon steel to soft brass, etc.

Send for Literature today

**THE DOALL COMPANY**

1211 Thacker St. Des Plaines, Ill.  
Associated with Continental Machines, Inc.  
Minneapolis, Minn.

### DI-ACRO BRAKE NO. 2

Creates non-stock sized angles, channels, Vees, etc. Folding width 12". Right or left-hand operation. DI-ACRO BRAKE No. 1 smaller size, folding width 6".



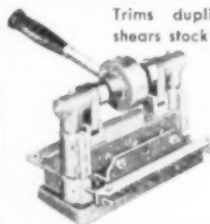
**METAL DUPLICATING**  
without DIES!

Send for Catalog

**O'NEIL-IRWIN MFG. CO.**  
307—8th Ave. S.  
MINNEAPOLIS, MINN.

### DI-ACRO SHEAR NO. 1

Trims duplicated stampings, shears stock sheets, etc. Shearing width 6".

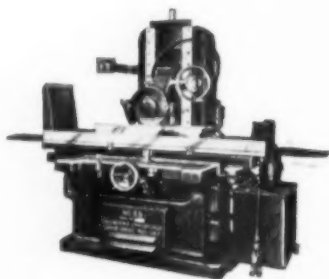


This shear cuts strips, squares up stampings, cuts slits or notches.

## SPEED & PRECISION

with

**Grand Rapids Hydraulic  
Feed Surface Grinders**



While keeping pace with the Defense Program Grand Rapids Grinders are maintaining the features that have made them one of the leading machine tools of the Nation.

One piece base and column insure accuracy at high speeds attainable on all Grand Rapids Grinders.

Write for Catalog GL-100

**GALLMEYER & LIVINGSTON CO.**  
110 Straight Ave., S. W.  
GRAND RAPIDS MICHIGAN

### PASSING PARADE

He has been a member of the Sundstrand organization for about seven years. He came there in 1935 from the Covell-Hanchett Company of Big Rapids, Michigan, and their subsidiary the Covell Manufacturing Company of Benton Harbor, Michigan, where he served in engineering work and as Sales Manager of the latter division. He was associated with this firm for about ten years, and prior to that time was associated with the Hutto Engineering Company of Detroit, Michigan.

The recently organized George Keller Machinery Company at Buffalo announces that after February 14 they will represent Baker Brothers in the Western New York territory. Mr. KELLER, who was with the R. L. Crane Machinery Company for 6½ years, organized his own concern the first of the year.

H. E. GROUT has been appointed as superintendent of the small motor division of the Westinghouse Electric and Manufacturing Company. He has been with the company since 1925.

HALDWELL S. COLBY, locomotive division; FRANK K. METZGER, Standard Steel Works division; FREDERICK G. SCHRANZ, Baldwin Southwark division; and NORRIS H. SCHWENK, Cramp brass and iron foundries division, have been appointed as divisional vice-presidents of the Baldwin Locomotive Works.

J. O. ELLISON has been appointed as sales manager of the Fray Machine Tool Company, Glendale, California. Mr. Ellison comes to Fray from the Smith Booth Usher Company of Los Angeles.

THE VANDYCK CHURCHILL COMPANY has been appointed the exclusive sales agent for Baker Brothers drilling equipment which territory covers eastern New York State, the metropolitan area, including New Jersey and Fairfield County, Connecticut.

S. P. FLENNIKEN, JR., formerly district manager of the Indianapolis office of the Berger Manufacturing division of Republic Steel Corporation, has been made branch office manager in Chicago for the company.

DWIGHT A. BESSMER has been appointed to the position of assistant director of purchases at the Timken Roller Bearing Company. Mr. Bessmer has been with the company since 1929.

W. L. KENNICOTT, previously Los Angeles sales manager of the McKenna Metals Company, is now at the head office and factory at Latrobe, Pa., in the management of sales and engineering of Kennametal tools and their applications.

With headquarters in Indianapolis, R. E. BINGMAN has been appointed district manager for the Indiana territory by the Jessop Steel Company, Washington, Pa.

## NEW TAYLOR "HI-DUTY" DRILLING MACHINE

**MODEL  
F-400**



**PROMPT  
DELIVERIES**

Moderately priced production drilling machinery embodying many outstanding features. Modern design provides ease of operation. Sturdy construction assures dependable drilling service and long life.

- CAPACITY — 1/32" to 1/2"
- JACOBS KEY-TYPE CHUCK
- OVERSIZE BALL-BEARING SPINDLE
- "DEPTH OF CUT" GAUGE

These Drill Presses come equipped with or without 1/3 H.P. "V" belt drive motors in both Bench and Floor type models. Write for descriptive circular and prices.

**TAYLOR MANUFACTURING CO.**  
3056 West Meinecke Avenue  
MILWAUKEE WISCONSIN

Since the assault on Pearl Harbor the supply of tungsten has been further reduced.

This Company has saved thousands of tons of tungsten in its thirty years of history.

Our Country cannot afford to have a single waster.

**NATIONAL TOOL SALVAGE CO.**  
3816 Beaubien St.  
Detroit, Mich.



## DIAMONDS for Defense

BIG-HED Loc-Key-Set Diamond Nibs provide cooler dressing, permit closer tolerances. For best results we recommend 1 karat for each 7" diameter of wheel. Three grades of diamonds - Common, Medium and Select. Prices per karat: \$12, \$24 and \$48. Contour template diamonds supplied only in Medium and Select grades. D. T. Co. Nibs are carried in stock. 24 hr. re-setting service, \$1.00 Postpaid.



Pat.  
Pend.

**DIAMOND TOOL CO., Not Inc.**  
938 E. 41st Street CHICAGO, ILL.

New Loc-Key-Set feature of BIG-HED Diamond Nibs permits micrometer control of diamond pass. Unique internal key construction absolutely prevents turning or shifting of diamond slug. Diamonds in sizes from 1/4 to 10 Karats. Orders shipped promptly. Billed subject to approval. When ordering, specify wheel diameter and grade.

PITTSBURGH  
472 Frick Bldg.  
(Atl. 3226)  
NEW YORK  
507 Fifth Ave.  
(Va-6-1818)



## CUT SET-UP TIME 75% WITH ADVANCE T-SLOT CLAMPS

OLD  
WAY  
8 min.



NEW  
WAY  
2 min.

For use on the T-slots of jig borers, slotters, lathes, milling machines, drill presses, planers and grinders.

- Replaces the bolt, the strap and the jack in the job set up.
- Requires less clamping.
- Made of high-grade alloy steel.
- Direct clamping secures perfect accuracy.
- Gives more working surface.
- Protects work from marks.

**ADVANCE MACHINE WKS.** 3727 Weiser Pkwy. FT. WAYNE, IND.

## To Get Information in Double Quick Time—

use the very convenient business reply cards in this issue on pages 133 and 134.

Fill in the number of the item described, mail the card—no stamp required.

## EVANS HIGH SPEED STEEL REAMERS



LOOK AT THESE  
FEATURES

- No honing.
- Will not chatter.
- Chrome-like finish.
- Perfect alignment.
- Full bearing surface.
- Left and right spirals.
- 50 to 80 thousandths expansion.
- Cannot fall in slots or oil grooves.
- Extension pilots for line-up work.

**WILL SHIP ON  
30 DAYS' TRIAL**

WRITE FOR  
CIRCULAR

**EVANS FLEXIBLE REAMER CORPORATION**  
4539 Ravenswood Ave., Chicago, Ill.

FEBRUARY, 1942

## Having difficulty holding tolerances?

FLOATS  
R  
A  
D  
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A  
L  
L  
Y



## DEMAND THE ZIEGLER ROLLER DRIVE Floating Holder for Taps and Reamers

AUTOMATICALLY compensates for machine spindle misalignment, eliminating over-sized or bell-mouthed holes.

Helps produce unbelievable accuracy on both new and old equipment.

Furnished with male or female taper, straight, threaded or special shanks to fit any machine used for tapping or reaming.

**W. M. ZIEGLER TOOL CO.**  
1920 Twelfth Street DETROIT

## Rotorex UNIVERSAL TOOL & CUTTER GRINDER FOR ALL KINDS OF TOOLS

Cylindrical  
Internal  
Tap & Surface  
Grinding

**Quick Delivery**  
by  
Large Scale  
Production

Capacity  
8" x 15"



**DOUGLAS MACHINERY CO., INC.**  
150 BROADWAY, NEW YORK, N. Y., Dept. 805

A  
LaSalle  
Design

**Tool Designing  
Machine Designing  
Aircraft Tool Designing  
Product Designing  
Engineering Service**

**LA SALLE DESIGNING CO.**  
628 W. LAKE ST.  
CHICAGO, ILLINOIS  
Monroe 2345



• The most valuable tool in industry today! Exclusive features of Hobart "Simplified" Arc Welders let you speed up production while increasing quality of the welds. Each welder withstands hours and hours of continuous welding, yet remains cool and efficient. They're easy to operate and get lower current costs. Write today for details.

**Valuable New Welding MANUAL**

Just off the press! Contains 516 pages of interesting welding data written in simple language. Profusely illustrated with helpful charts and diagrams. Send check now for this valuable book or have us send COD. **\$2.00**  
Postpaid, only .....

**Hobart Bros. BOX. 1E. 22 TROY, OHIO**  
one of the world's Largest Builders of Arc welders

—PASSING PARADE—

**F. H. LINDUS**, formerly Los Angeles branch manager for Timken, has been transferred to sales promotion work at Canton, Ohio for the Timken Roller Bearing Company.

The election of **DEAN ROLLANS** as vice president in charge of sales and the appointment of **WILLIAM H. HUSTED** as assistant to the president has been announced by the Wickwire Spencer Steel Company.

**HOWARD W. DUNBAR**, vice president and general manager of the machine division, Norton Company, on duty for more than a year as technical chief of the OPM Tools branch has been promoted to assistant chief of the branch.



**JOSEPH MORGANTHALL**  
Heart attack takes A.S.T.E. member.

**Died**

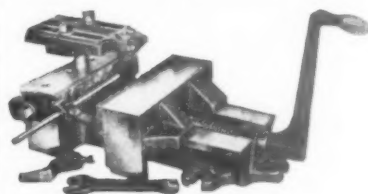
**JOSEPH B. MORGANTHALL**, 47, a foreman at the John Deere Wagon works, Moline, died suddenly of a heart attack in his home at Rock Island on Saturday, January tenth. A veteran of the first World War, Mr. Morgenthall was a member of the Tri-Cities chapter of the A.S.T.E. and chairman of the chapter from 1940 to 1941. At the time of his death he was serving on the National membership committee of the A.S.T.E.

**MISS NELLIE A. BENNETT**, secretary and treasurer of the Worcester Gear Works, died at her home recently.

**WILLIAM F. QUINN**, office manager of the Baush Machine Tool Company, died January 17 at his home in Springfield, Mass. He had been with the company for 15 years.

**LEROY EDWARD FAKE**, Plant Engineer for the Remington Arms Company, died at Ilion, New York, January 4.

**At times we can ship some sizes FROM STOCK**



6", 9", 12" Jaws

**GRAHAM  
MULTI-PURPOSE VISE**

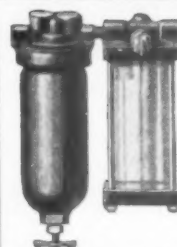
Tremendously increased demand has enabled us to install new high-production methods, so that we usually are able to keep a small stock ahead. Vise is used on driller, planer, miller, shaper, etc. with or without Jig Attachments shown.

Also shipping from stock — **KNURL HOLDERS**, to fit lathe turret. **DRILL SPEEDERS**, to increase speed 3 times.

Request Circulars and Prices

**GRAHAM MFG. CO., Inc.**  
72 Bridge St. East Greenwich, R. I.

• **M-B** •  
**Automatic Air-Line  
FILTERS and  
LUBRICATORS**



**Eliminates  
Costly  
Shut-Downs**

due to foreign matter in air-lines and lack of lubrication at working points.

**Removes 96% to 97% of  
All Water, Dirt and Scale**

from air-line. Air passes through a series of brass discs with .002 spacings, which are 2 1/2 times finer than 120 mesh screen, affording the finest degree of filtration that can be obtained by any known method.

Then, as the air passes through the head of the Lubricator, oil is delivered into the purified air-line in any desired volume.

**Write for Literature  
and Free Trial Offer**

**M-B PRODUCTS** EXPORT OFFICE  
130 E. LARNED ST. DETROIT, MICH. 44 WHITEHALL ST.  
New York, N.Y., U.S.A.

**THE TOOL ENGINEER**

## EVEREDE BORING BARS



Number 3 Set

These are the only boring bars on the market having the economical triangular bit, permitting the use of a larger bar diameter as the bit cuts ahead of the bar. This new design insures rigidity, making higher boring speeds and heavier cuts possible.

Everede Boring Bars are made of the finest heat treated nickel steel and each bar is furnished with six triangular high speed steel bits.

The Everede Boring Bar also permits the use of a solid stellite or carbide tool bit by clamping the bit in the "V" Type grip holding it firmly without danger of breakage.

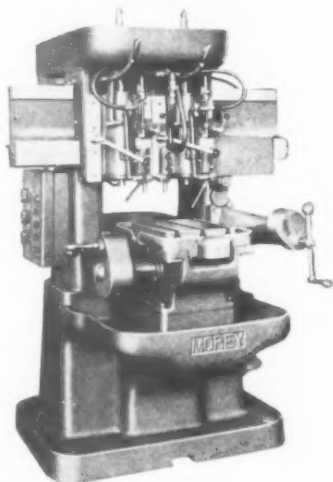
Write for descriptive folder.

### EVEREDE TOOL CO.

WILLIS STUTSON  
184 N. Wacker Drive Chicago  
Representatives in principal cities

## MOREY No. 12M High Speed Vertical PROFILER MILLER

Preloaded Precision Bearings for Spindles

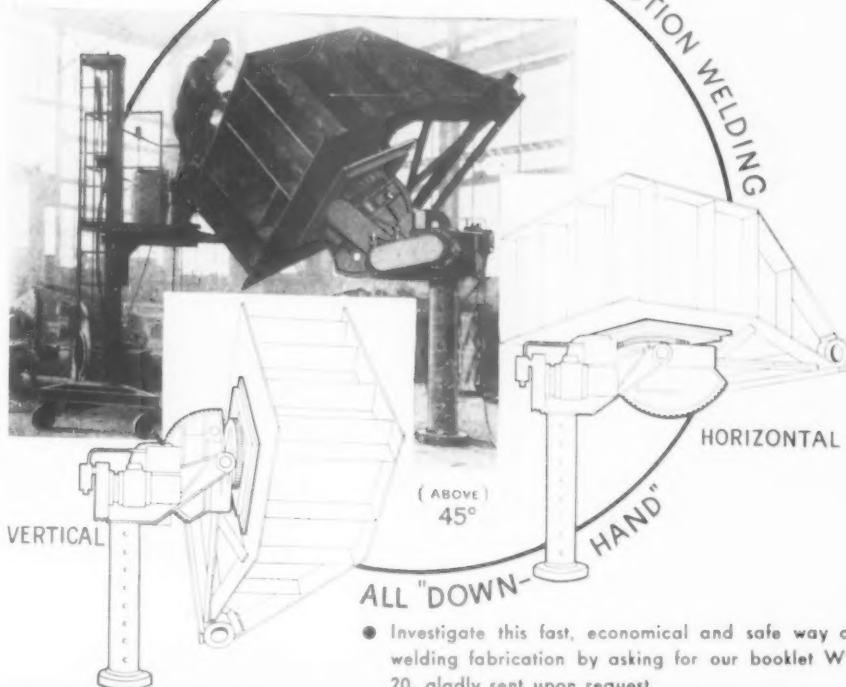


Production of interchangeable parts requiring milling of any contour or outline can be materially speeded up by this Profiling and Milling Machine.

Ask for Circular No. 680-A

**MOREY**  
MACHINERY CO., INC.  
410 BROOME ST., NEW YORK

## C-F POSITIONERS FOR PRODUCTION WELDING



● Investigate this fast, economical and safe way of welding fabrication by asking for our booklet WP 20, gladly sent upon request.

**CULLEN-FRIESTEDT CO.,**  
1318 S. KILBOURN AVE. CHICAGO, ILLINOIS

## Increase Production WITH WITTEK Automatic ROLL FEEDS AND REEL STANDS

for Any Make or Size Punch Press

Wittek Automatic Roll Feeds provide an improved and simplified method of punch press operation that insures rapid feeding under all conditions. Wittek Roll Feeds handle any type of coiled strip stock and are made in single roll, double roll, and compound types with straighteners, in models to feed in any of four directions.

Wittek Adjustable Reel Stands provide automatically expanding coil holders that center the coil and assure maximum production by eliminating looping, tangling and backlash of stock.

If your production problem involves feeding coiled stock to punch presses, it may be solved by consulting us. Your inquiry will be given immediate attention. Send for complete descriptive catalog.



**WITTEK** MANUFACTURING CO.  
4307 W. 24TH PL., CHICAGO, ILL., U. S. A.



REGRIND TO LOWER COSTS

REGRIND TO SAVE TIME



**ROTARY POWER CUTTERS**  
"Ground from the Solid after Hardening"

DESIGNED AND SERVICED BY  
**SEVERANCE TOOL COMPANY**  
1522 East Genesee Avenue  
SAGINAW, MICHIGAN



**TO INSTRUCT  
NEW MEN  
in the handling of  
DIAMOND TOOLS**

we will send you  
a valuable booklet. No  
charge, no obligation.

**KOEBEL DIAMOND TOOL CO.**  
9348 Grinnell Ave., Detroit

**KOEBELITE  
DIAMOND TOOLS**

Multi-Point, Multi-Set, Multi-  
Edge, and Single Set. Dia-  
monds for all Industrial  
Purposes.

## FEBRUARY MEETINGS

**BALTIMORE**—Feb. 4. 8:30 P.M. Sears and Roebuck Auditorium, North and Hartford Avenues, Baltimore. Mr. O. Peterson will speak on new and modern applications of power brushes in industry and the defense program. Reservations: Leslie MacGregor, 501 Hollen Road.

**BINGHAMTON**—Feb. 4. 7:30 P.M. Arlington Hotel. Mr. Harte Cook of the American Locomotive Company will give talk on modern diesel engines.

**COLUMBUS**—Feb. 12. 6:30 P.M. Fort Hayes Hotel. The speaker is Mr. A. T. Colwell whose subject will be, "The Engineer's Part in the National Defense Program."

**DETROIT**—Feb. 12. Dinner 6:30 P.M. Huyler's Concourse dining room in the Fisher Building. The technical session is at 8:30 P.M. with A. H. d'Arcambal, consulting metallurgist and past president of A.S.T.E., as the speaker. His subject, "The Machinability of Metal", will be illustrated with slides and specimens. Election of officers will take place at this meeting.

**HAMILTON**—Feb. 12. 6:30 P.M. Dinner, The Royal Connaught Hotel. Frank W. Curtis, national president, will speak on tool engineering.

**PEORIA**—Feb. 3. 6:30 P.M. Creve Coeur Club, Peoria. The speaker is Mr. John O'Conner, vice president, Lyon Metal Products Company, whose subject will be, "Planning and Production Scheduling." There will also be a movie on motion economy. Reservations: E. C. Bowton, 412 Thrush.

**PHILADELPHIA**—Feb. 5. 6:15 P.M. Engineers Club of Philadelphia. Closed meeting for members only. There will be an election of officers and discussion of final plans for anniversary meeting to be held Feb. 28.

**PITTSBURGH**—Feb. 6. 6:30 P.M. McCann's Restaurant. John Haydock, managing director of American Machinist, will talk on machine tools in defense industries.

**ROCKFORD**—Feb. 5. 6:30 P.M. 11th Floor, Hotel Faust. It is to be a joint meeting with the Rock River Valley Engineering Council. The speaker will be Mr. Joseph Geschelin, Detroit editor, Chilton Publications.

**ST. LOUIS**—Feb. 12. 6:30 P.M. Melbourne Hotel. The speaker will be Carroll Edgar whose subject is, "Defense Tooling Including Carbide Dies."

**SCHENECTADY**—Feb. 12. 6:30 P.M. "Ten - O - One" Veterans' Memorial Hall. Mr. J. E. Erb will speak on the heat treatment of steel. Reservations: N. Y. Coxe, Building 41, Room 235, General Electric Company, Schenectady.

**SOUTH BEND**—Feb. 10. 7:00 P.M.

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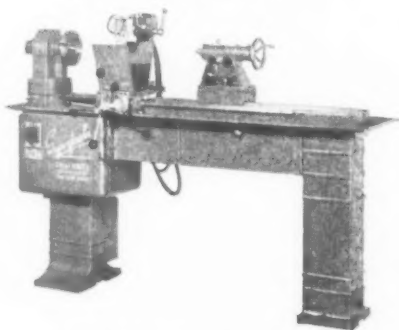
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FEBRUARY, 1942

## —FEBRUARY MEETINGS—

Indiana Club. The speaker will be Peter F. Rossman, development engineer, Curtis Wright Corp., whose subject is "Dies and Templates for Airplane Parts". Reservations: Glave Bunch.

**SPRINGFIELD**—Feb. 9, 6:30 P.M. Dinner. Westinghouse Auditorium. It will be a joint meeting with the A.S.M. The speaker will be Mr. E. S. Patch, sales manager, Moraine Products Division, General Motors. The subject of his talk will be Powder Metallurgy.

**SYRACUSE**—Feb. 10, 7:00 P.M. Dinner. Hiawatha Room of the Onondaga Hotel. 8:00 P.M. Technical Session. Malcolm F. Judkins, chief engineer, Firthite Div., Firth Sterling Steel Company, will speak on the latest developments in carbide tools.

**TRI-CITIES**—Feb. 4, 6:30 P.M. Blackhawk Hotel, Davenport, Iowa. Dr. H. A. Frommelt of the Kearney and Trecker Corporation will be the speaker and "Milling Operations" will be his subject. In addition, Mr. Scheid of Columbia Tool Steel Company will show a film on tool steel manufacturing. Reservations: L. J. Rodgers, Deere and Mansur Works, Moline.

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## NEXT MONTH

The **TOOL ENGINEER** will be a special issue describing 10 years of progress in Tool Engineering and commemorating the 10th anniversary of The American Society of Tool Engineers. Look for it—out on March 10th.

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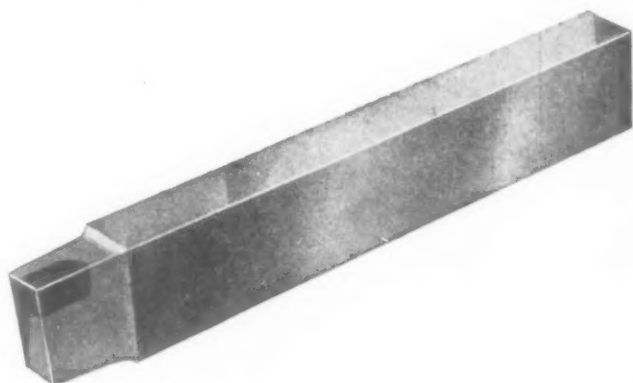


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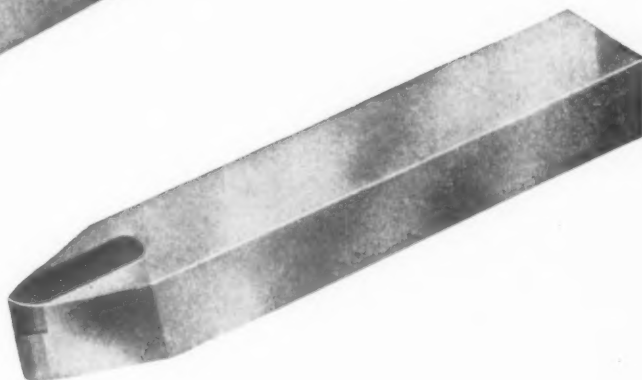
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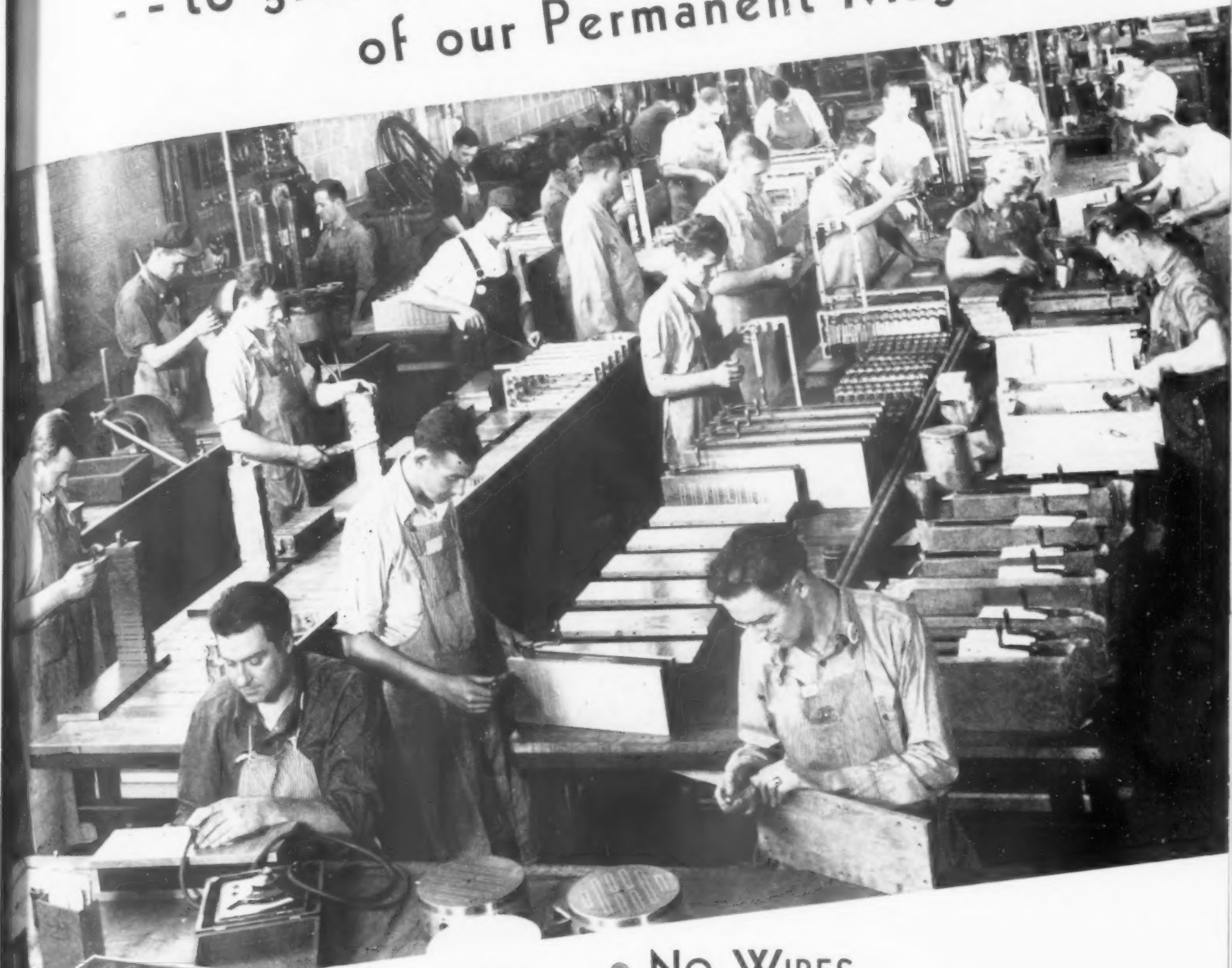
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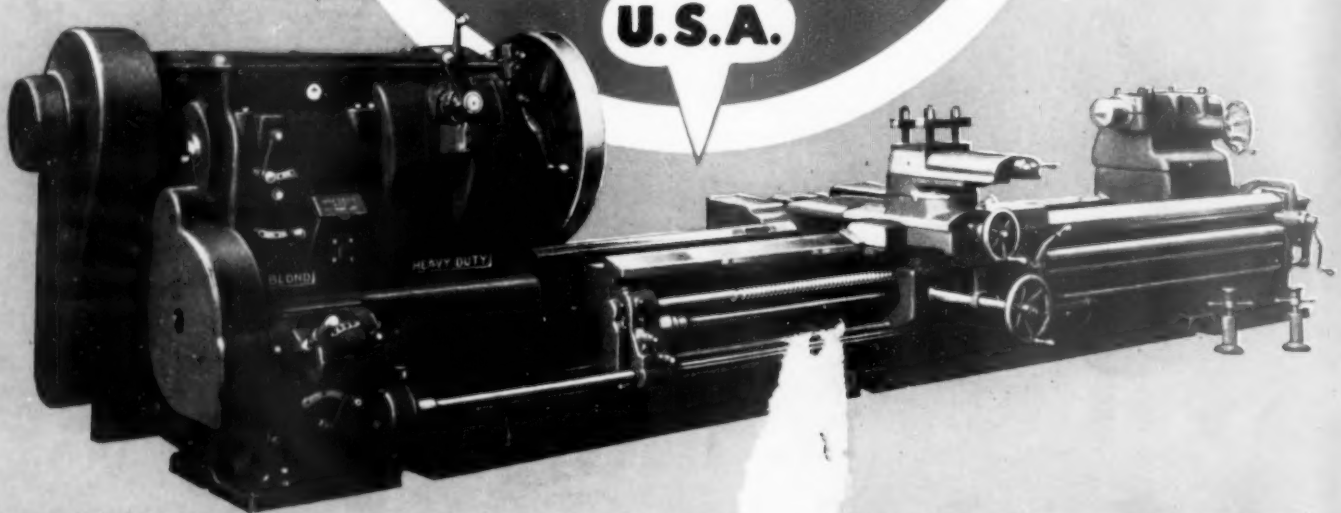
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